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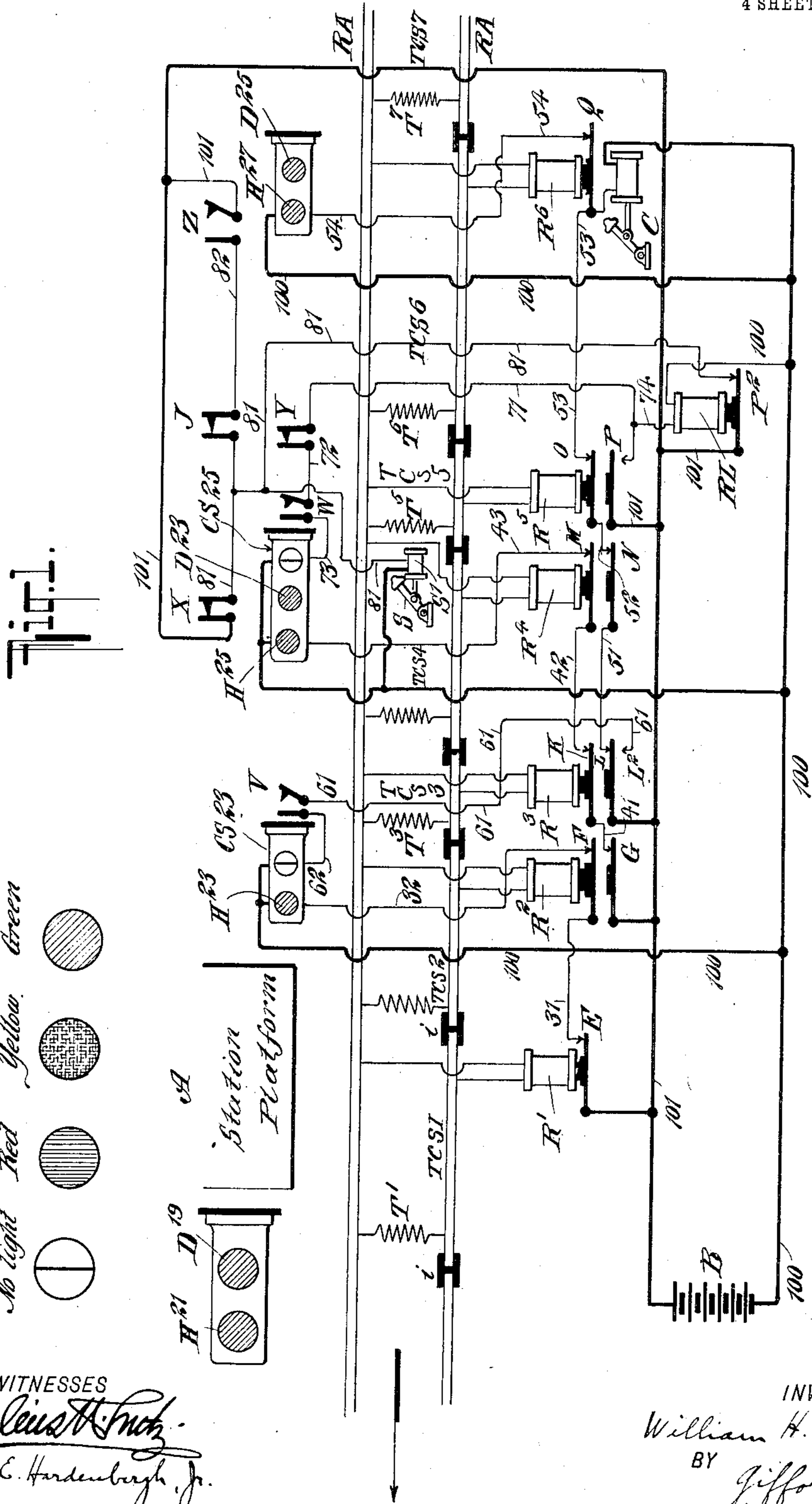
PATENTED SEPT. 1, 1908.

W. H. ELLIOTT.

AUTOMATIC CALLING ON SIGNALS.

APPLICATION FILED DEC. 24, 1907.

4 SHEETS—SHEET 1.



WITNESSES

WITNESSES
Julius H. Fuchs.
J. C. Hardenbergh, Jr.

INVENTOR

William H. Elliott

BY

Gifford & Bull

ATTORNEYS

No. 897,607.

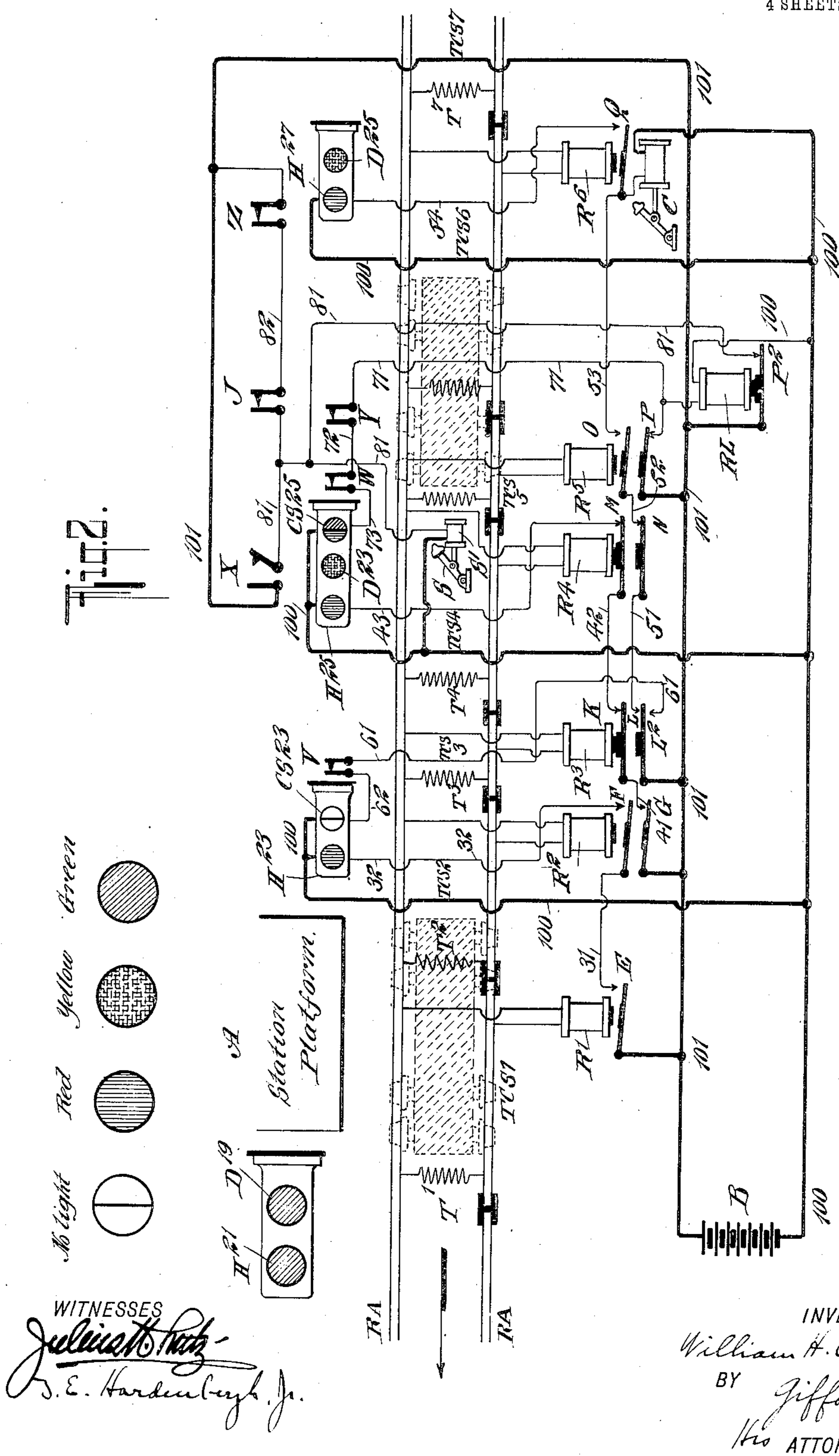
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4 SHEETS—SHEET 2.



WITNESSES

WITNESSES
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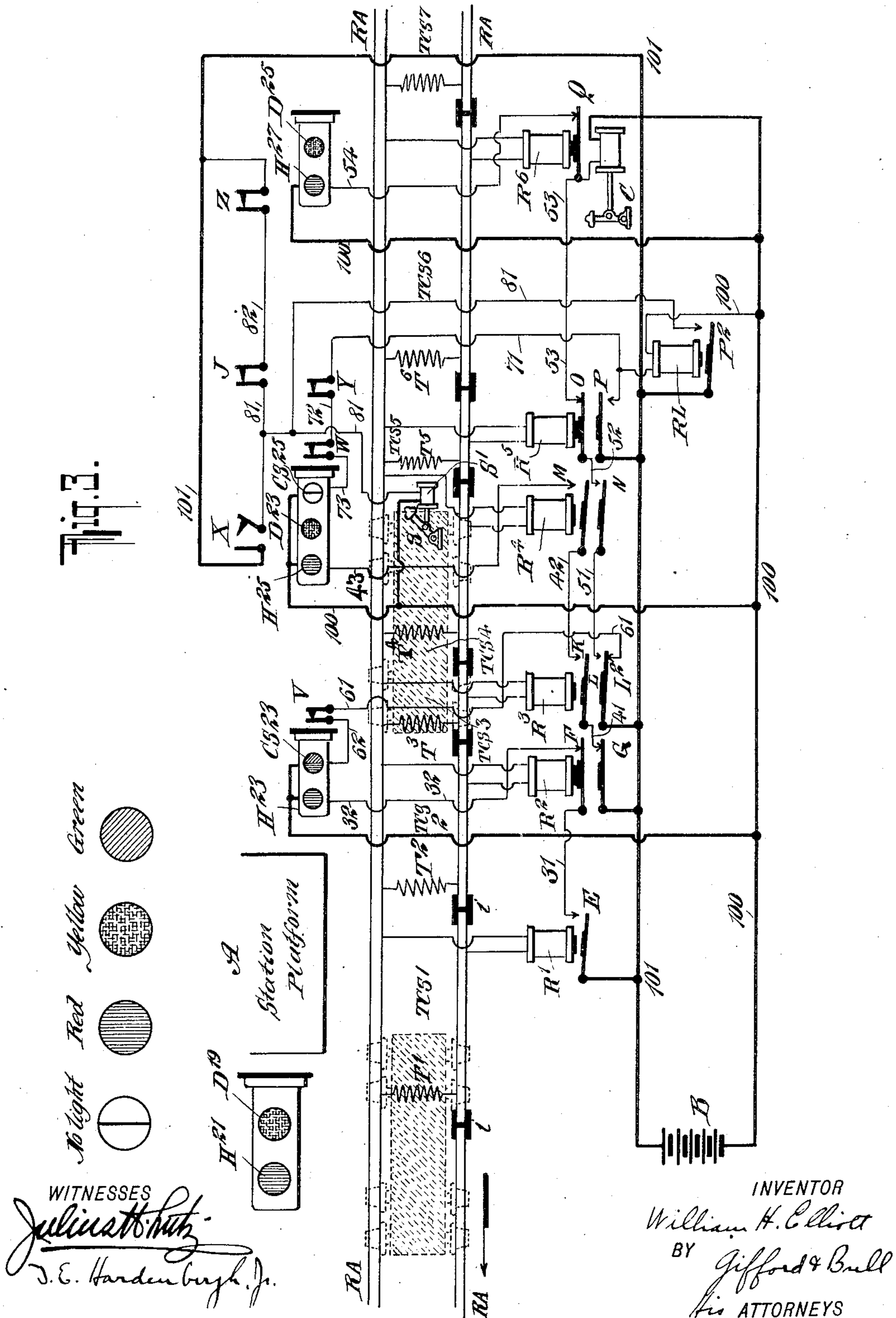
BY

BY *Gifford & Buel?*
His ATTORNEYS

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4 SHEETS—SHEET 3.



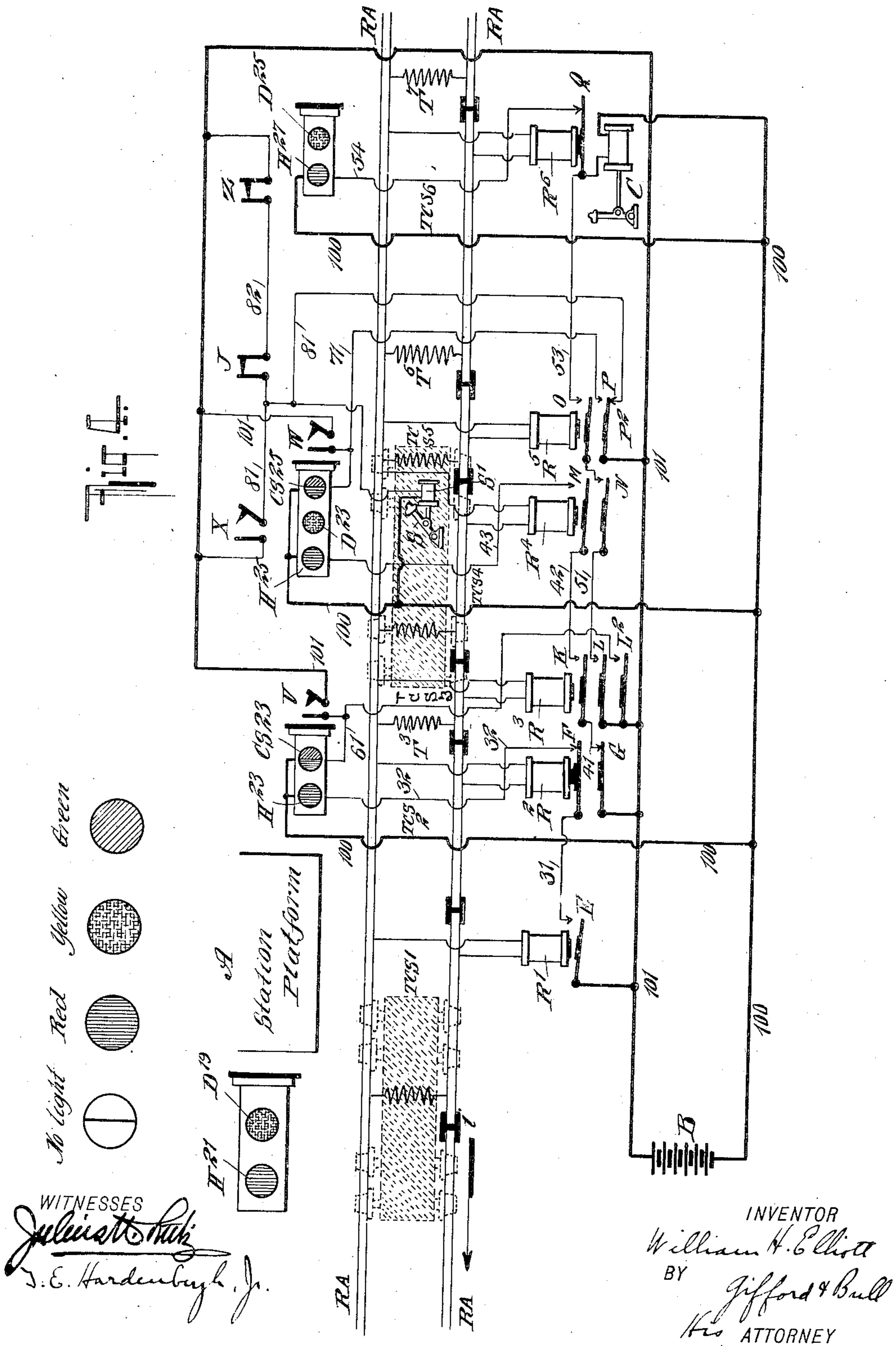
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4 SHEETS—SHEET 4.



UNITED STATES PATENT OFFICE.

WILLIAM H. ELLIOTT, OF NEW YORK, N. Y.

AUTOMATIC CALLING-ON SIGNAL.

No. 897,607.

Specification of Letters Patent.

Patented Sept. 1, 1908.

Application filed December 24, 1907. Serial No. 407,921.

To all whom it may concern:

Be it known that I, WILLIAM H. ELLIOTT, a citizen of the United States, and a resident of New York city, in the county and State of New York, have invented certain new and useful Improvements in Automatic Calling-On Signals, of which the following is a specification.

My invention relates to improvements in automatic and semi-automatic or interlocking block signal systems, whereby a distinctive calling on signal placed preferably at the entrance of a block section of track and rendered operative by the occupancy of such section or an overlap following such section, is adapted to operate when a train enters a section of track preceding the signal and thus to give permission to the train to pass a home signal at the entrance of the block section, when said home signal is displaying a stop indication owing to the occupancy of the block section or its said overlap. Unless the distinctive calling on signal were displayed the stop indication of the home signal would be a positive stop signal and would require a train approaching it to stop until special permission had been given for the train to proceed and enter the block ahead which was occupied, or the overlap of which was occupied, and special precautions had been taken to secure the proper and safe movement of the train.

By the use of my invention, the absolute character of the blocking or spacing of trains under the present automatic systems is changed and considerable flexibility in the movement of trains is permitted; an especial advantage resulting from the fact that a second train may enter a block section upon which a station is located and may closely follow a preceding train as it leaves the station, without coming to a stop and waiting until the station block section is unoccupied before it enters such section; at the same time my invention does not diminish the degree of safety with which trains may be operated, by reason of the fact that a train approaching a home signal indicating stop must reduce its speed to that prescribed for a train approaching that signal; otherwise the calling on signal will not be displayed until the train had already passed it and (when used) an automatic control device will operate to set the brakes of the train which has failed to reduce speed.

My invention is also adapted for use in connection with an automatic control device, of any well known type, adapted to cause the brakes of a train to be applied when the train is attempting to proceed contrary to signals or when the speed of the train exceeds that permissible at any given point adjacent to which the stop device is located. It will also be evident that my invention may be used in connection with semi-automatic or interlocking signal systems as well as those of the automatic type.

It is not my purpose to limit the application of my invention to that shown for illustration in the accompanying drawings and set forth in the following description, but I desire to broadly cover my invention which consists in the construction, arrangement, combination and operation of parts set forth in and falling within the scope of the claims hereto appended.

In the accompanying drawings like characters of reference denote like parts in all the figures thereof.

Figure 1 represents a diagrammatic plan view of the preferred application of my invention in normal position with the track unoccupied by a train; train movement being in the direction indicated by the arrow. Fig. 2 represents a diagrammatic plan view of the preferred application of my invention showing its operation when the track is occupied by a train standing at a station platform, and by a second train which is or may be running over the releasing section in the rear of the platform thereby causing the display of the calling on signal to allow the train to proceed without having its brakes applied by the operation of the automatic stop device. Fig. 3 represents a further operation of my invention, as arranged in the preceding figures, wherein the first train is leaving the station platform, and the second train has arrived at the releasing section for the calling on signal immediately in rear of the platform, causing the display of this signal. Fig. 4 represents a modified application of my invention, the situation of trains on the track being as shown in Fig. 3.

Turning now to a detail description of my invention and referring to Fig. 1 wherein the track is shown as unoccupied by trains, reference characters RA denote the rails of the track; one of the rails, here shown as the left-hand rail looking in direction of train move-

ment, is divided by means of insulating blocks into track circuit sections TCS 1, 2, 3, 4, 5, 6, and 7, of desired length. For the purpose of description I have shown block sections as consisting of two track circuit sections, it being understood that the number of circuit sections comprised in a block may be arranged as circumstances may require. At the entrance of each block section are located home signals indicated as H 21, H 23, H 25, and H 27. Distant signals D 19, D 23, and D 25 may be provided as shown to repeat the indication of the next preceding home signal. These signals may be of any of the well known power operated or slotted types adapted to operate to give a stop indication when the controlling or operating circuits are opened and to give a proceed indication when the circuits are closed.

The signal used to display the calling on indication to permit a train to pass a home signal indicating stop and enter a block occupied by a preceding train is placed below the other signals; such calling on signals are shown, in connection with home signals H 23 and H 25, as CS 23 and CS 25. The calling on indication is shown as adapted to be given by a light to be exposed behind a lens or glass of two colors, preferably red and green; the red light indicating that the block or overlap in advance is occupied and the green light that the train may proceed with caution. In the arrangement of signals as shown, no calling on indication is displayed in connection with a home signal indicating proceed or when the releasing section for the calling on signal is unoccupied by a train; but if desired, a stop or caution indication may be displayed normally and the calling on indication displayed when a train is on the releasing section with the home signal indicating stop. In place of the glass of two colors, a single light, a combination of lights of different colors, or a blade or arm of special form, painting or position may be used as desired to give the calling on indication.

Returning to a further description of the track circuit sections; section TCS 1 is comprised in the block governed by home signal H 23. Section TCS 2 is comprised in the block governed by signal H 23 and is the overlap section of signal H 25. Section TCS 3 is comprised in the block governed by signal H 25, is part of the overlap for signal H 27 and is the releasing or operating control section for the displaying of calling on signal CS 23. Circuit TCS 4 is comprised in the block governed by signal H 25 and is part of the overlap for signal H 27. Circuit TCS 5 is comprised in the block governed by signal H 27, is part of the overlap for the next signal in the rear (not shown) and is the releasing or operating control section for the display of calling on signal CS 25. TCS 6 is comprised in the block governed by signal H 27 and is part of

the overlap for the next signal in the rear. The releasing track circuit sections are short sections being preferably of the length of a single car; this construction being for a purpose as will hereafter be set forth. For the purpose of description it is not necessary to consider any further block sections of the track. The track circuit sections are of usual construction provided with a battery or transformer indicated as T^1 , T^2 , T^3 , T^4 , T^5 , T^6 and T^7 , or any desired source of supply, for an electric current to the rails at one end of each section and a relay indicated R^1 to R^7 with connections to the rails at the other end of each section. In place of the one rail type as shown, in which one rail is used for the track circuits and the other is a common return for all or several track and power circuits, both rails may be divided into sections by the use of insulating joints and be used in each section for the signal current of that particular section only.

Relay contacts controlling circuits are indicated by reference letters E, F, G, K, L, L^2 , M, N, O, P, P^2 and Q; and are front contacts except L^2 and P in Figs. 1 to 3 inclusive, and P^2 in Fig. 4. Contact P^2 is operated by a magnet of relay RL which is adapted to provide an additional contact by closing P^2 when the circuit through RL is completed by the making of back contact P. This repeating relay RL is used in place of putting a third contact on R^5 , the operation in either case being identical.

Reference letter V indicates a circuit controller actuated by signal H 23 and adapted to separate contacts when the signal indicates proceed.

W and X indicate circuit controllers actuated by signal H 25 and adapted to respectively separate and close contacts when the signal indicates proceed.

Z indicates a circuit controller actuated by signal H 27 and adapted to open contacts when the signal indicates proceed.

Circuit controllers V and W in Fig. 4, where the display of the calling on indication is controlled by front contacts of track relays, are arranged to close the controlled circuit when the home signal is indicating proceed.

J and Y indicate circuit controllers actuated by control device S (hereafter more fully to be described) and adapted to close the controlled circuits when the control device S is set in a clear position to allow an approaching train to proceed.

A changed operation of controller V and W will be described in connection with the modified form of calling on signal control shown in Fig. 4.

Circuit controllers J and Y are shown merely for the purpose of illustration in connection with the form of control device described and may be omitted as desired, the

stop device then being adapted to operate by any chosen form of regulating and releasing devices.

The power supply or battery furnishing currents for line and signal circuits is indicated by B and the feed wires conducting this current by 101 and 100. The wires of the circuit controlling the home signal H 23 are indicated by 31 and 32; those controlling calling on signal CS 23 by 61 and 62; controlling signal H 25 by 41, 42, and 43; controlling calling on signal CS 25 by 71, 72, and 73; controlling signal H 27 by 51, 52, 53, and 54; controlling the stop device by 81 and 82; and controlling repeating relay RL by 71 and 74. The wires of the circuits for the distant signals are not shown.

When an automatic train control device is used in connection with a signal system my invention will be found to be capable of peculiarly valuable application. For the purpose of description, such a device, of the arm or tripper form, has been shown placed between the rails at signal H 25, although any device adapted to set the brakes of a train attempting to pass the control device when in operative position may be used.

S indicates the arm adapted when raised to strike a valve on a train (not shown) and apply the brakes should such train endeavor to pass a signal indicating stop.

S¹ indicates the cylinder or magnetic device adapted to operate arm S.

A second control device has been shown as indicated by C; the position of this device would normally be adjacent to one of the rails on either side, or between the rails, in accordance with the type of device used, its location as shown being used for purpose of clear description in connection with the diagrammatic plan view.

Figs. 1 to 3 representing the same application of my invention it will be unnecessary to describe Figs. 2 and 3 apart from the description of Fig. 1, except as may be necessary in connection with description of the operation of the invention as hereinafter set forth. The modified application shown in Fig. 4 will also be described hereafter.

The arrangement of signals as shown in Fig. 1 is the preferred arrangement wherein the home and distant signals show at clear or proceed when the track is unoccupied and no light is shown to an approaching train in the calling on signal. Various modifications in application may be made without departing from the scope of my invention such as, for example, the normal indication of stop and caution by home and distant signals and of stop or caution by the calling on signals.

Turning now to Fig. 2, the operation of the preferred application of my invention is as follows: A train entering track sections TCS 6 will shunt track relay R⁶ causing the armature to drop and break circuit at contact

point Q, thus causing the home signal H 27 to indicate stop, and the distant signal D 25 to indicate caution. As the train advances the track circuit relays are shunted as the head end of the train enters each track circuit section. Where a track circuit section is used as an overlap, the second home signal in the rear as well as the home signal at the entrance of the block, is made to indicate stop. Thus, for example, the head of a train being on track circuit section TCS 2 and the rear of the train on section TCS 3, signal H 27 is held at the stop indication as well as the signal H 25; the circuit to signal H 27 consisting of wires 101, contact L, wire 51, contact N, wire 52, contact O, wire 53, contact Q, wire 54, signal H 27, and common wire 100 would be broken at contact point L and the circuit to signal H 25, consisting of wire 101, contact G, wire 41, contact K, wire 42, contact M, wire 43, signal H 25, and common wire 100 would be broken at contact points G and K. When the rear of the train passes off of track circuit TCS 3, the relay contacts K and L will be closed and the circuit to signal H 27 completed, whereupon this signal will change to indicate proceed and if the next home signal in the rear (not shown) was at proceed the distant signal repeating the indication of signal H 27 will also change to indicate proceed.

The train being on section TCS 2 the relay R² will be shunted and signal H 23 will indicate stop, through the circuit to it being broken at contact point F so also signal H 25 will indicate stop its circuit being broken at point G. When the train is on both sections TCS 1 and TCS 2, in which position it is indicated as standing at station A, the circuit to signal H 23 will also be broken at point E and thus this signal will continue to indicate stop, while the signal H 25 will change to indicate proceed as contact points F and G close when the train leaves section TCS 2 (as shown in Fig. 3).

On a train approaching the station while the track at the platform was occupied, the approaching train would be stopped at signal H 25. Upon the front wheels of the approaching train running on track circuit TCS 5 which is the releasing section for calling on signal CS 25, the situation shown in Fig. 2 will be produced. As shown in the figure, the track circuit relay R 5 will be shunted when the train runs on this section, causing the back contact point P to close and while holding the circuit to signal H 27 open at O, closing the circuit of calling on signal CS 25 at P, the circuit for this indication being through wire 101, contact P, wire 71, circuit controller Y, wire 72, circuit controller W, wire 73, signal CS 25 and wire 100. It being remembered the contact at W is adapted to close when the signal H 25 indicates stop, and the contact at Y when the stop device

S is in an inoperative position as before stated. The closing of the circuit at P causes the calling on signal to display a red and a green light, indicating proceed with caution, block or overlap section for block ahead occupied. On receiving the calling on indication to proceed the train may proceed, passing the home signal which indicates stop and entering the block in advance.

10 In Fig. 3 the situation is shown where the incoming train has arrived at signal H 23 and the train previously standing at the platform is supposed to be leaving the station but has proceeded no farther than the position
15 shown. As the train leaving the station is shown as not having passed off of track circuits TCS 1, signal H 23 will be indicating stop. On the approaching train running on releasing track circuit section TCS 3 preparatory to stopping for signal H 23 the relay R³
20 will be shunted and the circuit to calling on signal CS 23 will be closed at contact point L², the circuit for this signal being from current supply wire 101, contact L², wire 61,
25 circuit controller V, wire 62, calling on signal CS 23, and common wire 100. The closing of the circuit at L² causes the display of the calling on indication, giving the train permission to proceed with caution into the
30 block ahead that is occupied and the train may run up to the station platform closely behind the leaving train.

As the calling on indication is of no use when the home signal for the same block is
35 indicating proceed, a circuit breaker W in the case of signal H 25 and V for signal H 23 have been provided, which will break the connection between the battery and the operating wire, 72 for calling on signal CS 25
40 and wire 61 for calling on signal CS 23, and hold these signals in the normal position while train is standing on or passing over the releasing track circuit section when the home signal for the block about to be entered indicates proceed.
45

The automatic control device placed at the entrance to a block will be lowered or cleared when the home signal at entrance of the block section is at proceed. But with a train
50 on TCS 2, and no train on TCS 5, the stop would be raised through the circuit to control device being broken at circuit closer X, signal H 25 being at stop, at circuit closer Z as signal H 27 would be indicating proceed,
55 no train being in the block or overlap section and at P² as relay R⁵ would be energized and the armature points raised, breaking circuit through relay RL causing armature to drop and separate contact points P². As
60 has been stated, releasing section TCS 3 is a short section and therefore it is possible for a train to be on the three sections TCS 3, TCS 4 and TCS 2 at one and the same time; should the stop of the control device be
65 adapted to be raised upon the first car of a

train entering TCS 2 there would be a danger that the stop would trip the brake setting device of those cars of the train which were still on section TCS 4; in order to obviate this difficulty the circuit to the control device
70 is so arranged that it will not be broken at point Z until the last car of the train leaves section TCS 3 and enters TCS 2 thereby effecting the change of signal H 27 to indicate proceed. With the block occupied as in Fig. 75
2 the circuit to the control device is broken at circuit closer X, signal H 25 giving a stop indication, but as the train is occupying section TCS 5 the relay R⁵ is shunted, the
80 armature making a back contact, completing circuit to relay RL and causing armature to pick up and complete circuit to control device through wire 101, contact P², wire 81, the stop and wire 100. On the circuit being
85 completed the control device will be lowered or cleared allowing train to proceed, the device remaining down as long as sections TCS 4 or 5 were occupied by a train and the circuit thereto being again broken at point
90 Z when the last car of the train leaves section TCS 3 as described above.

In the control of the automatic stop or train control device it is essential in order to provide against the display of a calling on
95 signal before the approach of a train on the releasing track circuit section that the releasing of the stop be dependent on the circuit being completed by the back contact P of the relay controlling the operating circuit and that through contact O and wire 53 the circuit
100 to the signal H 27 and control device C in the rear will be broken so that the signal in the rear H 27, will be made to indicate stop and the automatic train control device in the
105 rear will be put in the operating position to stop a train when the calling on indication CS 25 is displayed.

In the case of control device C, it is arranged that track circuit section TCS 6 shall be of a length greater than that of any train
110 which may be operated on the road, and therefore this device C is adapted to assume an elevated or operative position when the train enters TCS 5, there being no danger of the device being elevated under, and acting
115 to set the brakes of, the rear cars of the train which are still on TCS 6.

As has been before stated circuit controller Y is adapted to close contacts and complete the circuit to calling on signal CS 25 only
120 when the automatic control device is released by the completion of its circuit through P and P²; the arrangement of circuits is such that the release of the control device must occur before the calling on signal
125 can be operated by the completion of its circuit at Y. By reason of this fact, since the releasing sections are short sections, a train approaching a home signal which indicates stop must greatly reduce speed upon entering the
130

releasing section in order that there may be sufficient time for the control device to be released and the calling on signal displayed, before the train passes over the short releasing section and enters the section upon which the control device is located. The apparatus may be adjusted to effect the release of the control device with any desired degree of rapidity in accordance with the speed which it is desired to have a train assume, upon arriving at a stop home signal, before it will receive the calling on signal; hence a train running at a higher rate of speed than that prescribed will pass over the operating or releasing section and reach the control device before there has been sufficient time for the latter to be released, and the brakes of the train exceeding the prescribed limit of speed will be applied. This control of the speed of trains is of especial value at critical points, such as where there is a curve.

In Fig. 4 the calling on signals CS 23 and CS 25 are represented as being controlled by front contacts of the relays of the releasing sections TCS 3 and 5. These relays are shown as being shunted by a train on the track rails and breaking the circuit controlling the calling on signal. In the case of signal CS 23 at front contact L² and in that of signal CS 25 the circuit is broken at front contact P of relay R⁵. The circuit controlling the calling on signal being broken at front contact P through the position of the trains on the track circuit, the indication will be given by the changing of the mechanism.

It should be noted that the operation of the control device is independent of the circuit to calling on signal, the control being released only by the back contact of the relay of the releasing section. Should the circuit to the calling on signal fail and thus cause the indication to be displayed continuously when the home signal H 25 was indicating stop, no dangerous condition would exist as the working of the automatic control would not be affected by such failure and the display of the calling on indication when the releasing section was not occupied by a train would be an indication that the device or mechanism was out of order.

An automatic control device is not shown but may be used on section TCS 2 since that section is always occupied when a train is standing at the platform A; and a succeeding train having reduced speed before receiving the calling on signal CS 23 may run up to the rear of the train at the platform without danger of collision.

The application of my invention for use with any of the well known arrangements of semi-automatic or interlocking signal systems will be evident; in such a case when a switch located on a track section is to be set to permit a train occupying that section to take

the switch, the interlocking mechanism is manually set in operation by the throwing of a lever, the pressing of a button or by other means, causing the home signal, here termed the interlocking home signal, to be fixed in the stop indication, and rendering the calling signal incapable of operation by a train arriving on the releasing section. When the switch has been set to give the desired route the interlocking mechanism is again normally set in operation to permit of the operation of the interlocking home signal to give a proceed indication should the track section and overlap therefor be unoccupied, and rendering the calling on signal capable of operation by a train arriving on the releasing section, which calling on signal would then be operated should the preceding track section or overlap therefor be occupied. The operation of the interlocking mechanism also fixes the control device on the track section, in an operative position so that it cannot be released, upon a train coming on the releasing section, until a further operation of the interlocking mechanism.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a railway automatic signal system, in combination, a section of track, and a calling on signal adjacent the rear end of the section, said signal being adapted to be capable of operation when said section is occupied.

2. In a railway automatic signal system, in combination, a section of track, an overlap section for said section, and a calling on signal adjacent the rear end of said section, said signal being adapted to be capable of operation when said overlap section is occupied.

3. In a railway automatic signal system, in combination, a section of track, a home signal, a calling on signal adjacent the rear end of said section, said home signal being adapted to display a stop indication when said section is occupied, and said calling on signal being adapted to be capable of operation when said home signal indicates stop.

4. In a railway automatic signal system, in combination, a track section, a calling on signal adjacent the rear end of said track section, and a releasing section, said signal being adapted to operate upon said releasing section becoming occupied when said track section is occupied.

5. In a railway automatic signal system, in combination, a track section, a calling on signal adjacent the rear of the track section, an overlap section for said track section, and a releasing section, said signal being adapted to operate upon said releasing section becoming occupied when said overlap section is occupied.

6. In a railway automatic signal system, in combination, a track section, a calling on

signal adjacent the rear end of said section, a track circuit releasing section, the circuit of said section comprising a relay back contact, adapted to operate when said releasing section is occupied, said signal being adapted to be capable of operation when said track section is occupied and to be operated upon the operation of said back contact.

7. In a railway automatic signal system, in combination, a track section, a calling on signal adjacent the rear end of said section, and a track circuit releasing section, the circuit of said releasing section comprising a relay front contact adapted to operate when said releasing section is occupied, said signal being adapted to be capable of operation when said track section is occupied and to be operated upon the operation of said contact.

8. In a railway automatic signal system, in combination, a track circuit section, a relay contact controlled by the circuit of said section, an automatic train control device located in advance of said section, and adapted to be released upon the operation of said relay, and a second control device adapted to become operative upon the release of said first control device.

9. In a railway automatic signal system in combination, a track circuit section, a relay contact controlled by the circuit of said section, an automatic train control device located in advance of said section, and adapted to be released upon the operation of said contact, a second control device, and a signal in the rear of said section control device being adapted to become operative and said signal to be operated upon the release of said first control device.

10. In a railway automatic signal system, in combination, a track circuit section, a relay contact controlled by the circuit of said section and adapted to be operated when said section is occupied, an automatic train control device located in advance of said section and adapted to be released upon the operation of said contact, and a second train control device adapted to become operative upon the release of said first control device.

11. In a railway automatic signal system, in combination, a track circuit section, a relay contact controlled by the circuit of said section and adapted to be operated when said section is occupied, an automatic train control device located in advance of said section and adapted to be released upon the operation of said contact, a second train control device, and a signal in the rear of said section, said second control device being adapted to become operative and said signal to be operated upon the release of said first control device.

12. In a railway automatic signal system, in combination, a track section, a calling on signal, a releasing track section, and an automatic control device located in advance of

said releasing section and in rear of said section, said signal being adapted to operate and said control device being adapted to be released upon said releasing section becoming occupied when said track section is occupied.

13. In a railway automatic signal system, in combination, a track section, a calling on signal, an overlap section for said track section, a releasing track section, and an automatic control device located in advance of said releasing section and in rear of said track section, said signal being adapted to operate and said control device being adapted to be released upon said releasing section becoming occupied when said overlap section is occupied.

14. In a railway automatic signal system, in combination, a track section, a calling on signal, a track circuit releasing section, the circuit of said releasing section comprising a relay contact adapted to operate when said releasing section is occupied, and an automatic control device located in advance of said releasing section and in rear of said track section, said signal being adapted to be capable of operation and to be operated and said control device to be released upon the operation of said contact when said track section is occupied.

15. In a railway automatic signal system, in combination, a track section, a calling on signal, an overlap section for said track section, a track circuit releasing section, the circuit of said releasing section comprising a relay contact adapted to operate when said releasing section is occupied, and an automatic control device located in advance of said releasing section and in rear of said track section, said signal being adapted to be capable of operation and said control device to be in an operative condition when said overlap section is occupied, and said signal being adapted to be operated and said control device to be released upon the operation of said contact.

16. In a railway automatic signal system, in combination, a block track section comprising a track circuit section, and a second track circuit section in the rear of said first section, an automatic train control device in the rear of and adapted to be in an operative position when said first track circuit section is occupied, a calling on signal adapted to be capable of operation when said block section is occupied, a releasing track circuit section in the rear of said train control device, said signal being adapted to be operated and said control device to be released upon said releasing section becoming occupied.

17. In a railway automatic signal system, in combination, a track circuit section, an overlap section for said track section, an automatic train control device located on said track circuit section adapted to be in an

operative condition when said overlap section is occupied, a calling on signal adapted to be capable of operation when said overlap section is occupied, a releasing section in the rear of said track section, said control device being adapted to be released and said signal to be operated when said releasing section is occupied, and a second control device in the rear of said first control device adapted to be put in an operative condition upon the release of said first control device.

18. In a railway automatic signal system, in combination, a track circuit section, an overlap section for said track section, an automatic train control device located on said track section adapted to be in an operative position when said overlap section is occupied, a calling on signal adapted to be capable of operation when said overlap section is occupied, a releasing track circuit section in the rear of said track circuit section, the circuit of said releasing section comprising a relay back contact adapted to operate when the section is occupied, said control device being adapted to be released and said signal to be operated upon the operation of said back contact and a second control device in the rear of said first control device adapted to be put in an operative condition upon the release of said first control device.

19. In a railway automatic signal system, in combination, a track circuit section, an overlap section for said track section, an automatic train control device located on said track section adapted to be in an operative position when said overlap section is occupied, a calling on signal adapted to be capable of operation when said overlap section is occupied, a releasing track circuit section in the rear of said track circuit section, the circuit of said releasing section comprising a relay back contact adapted to operate when the section is occupied, said control device being adapted to be released and said signal to be operated upon the operation of said back contact, a second control device and a signal in the rear of said first control device, said second control device being adapted to be put in an operative condition and said rear signal to be operated upon the release of said first control device.

20. In a railway automatic signal system, in combination, a track section, a calling on signal and an automatic train control device, said signal being adapted to be capable of operation only when said control device has been released when said section is occupied.

21. In a railway automatic signal system, in combination, a track section, an overlap section for said track section, a calling on signal and an automatic train control device, said signal being adapted to be capable of operation only when said control device has been released when said overlap section is occupied.

22. In a railway automatic signal system, in combination, a calling on signal, an automatic train control device, and a releasing track section in the rear of said signal and said control device, said signal being adapted to be operated only when said control device has been released when said releasing section is occupied.

23. In a railway automatic signal system, in combination, a track section, a calling on signal, a train control device, and a releasing section in the rear of said signal and said control device, said signal being adapted to be operated only when said control device has been released when said track section and said releasing section are occupied.

24. In a railway automatic signal system, in combination, a calling on signal, a train control device, a track circuit releasing section in the rear of said signal and said control device, and a relay back contact controlled by said releasing section, said signal being adapted to be capable of operation only when said control device has been released and to be operated upon the operation of said relay back contact.

25. In a railway automatic signal system, in combination, a track section, a calling on signal, a train control device, a track circuit releasing section in the rear of said signal and said control device, and a relay back contact controlled by said releasing section, said signal being adapted to be capable of operation only when said control device has been released, and to be operated upon the operation of said relay back contact when said track section is occupied.

26. In a railway automatic signal system in combination, a track section, a releasing section, a calling on signal adjacent the rear end of said track section, said signal being adapted to operate upon said releasing section becoming occupied when said track section is occupied, and a train control device located in advance of said releasing section and adapted to be released upon said releasing section being occupied by a train, said release being adapted to be effected at such a rate of speed that said control device will remain operative to control said train should it pass over said releasing section at a speed greater than a predetermined speed.

27. In a railway automatic signal system in combination, a track section, an overlap section for said track section, a releasing section, a calling on signal adjacent the rear end of said track section, said signal being adapted to operate upon said releasing section becoming occupied when said overlap section is occupied, and a train control device located in advance of said releasing section and adapted to be released upon releasing section being occupied by a train, said release being adapted to be effected at such a rate of speed that said control device will remain

operative to control said train should it pass over said releasing section at a speed greater than a predetermined speed.

28. In a railway automatic signal system in combination, a track section, a track circuit releasing section the circuit of said releasing section comprising a relay back contact, a calling on signal adjacent the rear end of said track section, said signal being adapted to operate upon the operation of said back contact when said track section is occupied, and a train control device located in advance of said releasing section and adapted to be released upon the operation of said back contact by a train arriving on said releasing section, said release being adapted to be effected at such a rate of speed that said control device will remain operative to control said train should it pass over said releasing section at a speed greater than a predetermined speed.

29. In a railway automatic signal system in combination, a track section, an overlap section for said track section, a track circuit releasing section the circuit of said releasing section comprising a relay back contact, a calling on signal adjacent the rear end of said track section, said signal being adapted to operate upon the operation of said back contact when said overlap section is occupied, and a train control device located in advance of said releasing section and adapted to be released upon the operation of said back contact by a train arriving on said releasing section, said release being adapted to be effected at such a rate of speed that said control device will remain operative to control said train should it pass over said releasing section at a speed greater than a predetermined speed.

30. In a railway automatic signal system, in combination a track circuit section, a calling on signal adjacent the rear end of said section, and a track circuit releasing section, said signal being adapted to be operated upon said releasing section being occupied when said track section is occupied, one rail in each of said sections being adapted for use for the signal track circuit of said section only, and the second rail in each section being adapted for common use for the power current return and return of signal track circuit current.

31. In a railway automatic signal system, in combination, a track circuit section, a calling on signal adjacent the rear end of said section, an overlap section for said section, and a track circuit releasing section, said signal being adapted to be operated upon said releasing section being occupied when said overlap section is occupied, one rail in each of said sections being adapted for use for the signal track circuit of said section only, and the second rail in each section being

adapted for common use for the power current return and return of signal track circuit current.

32. In a railway automatic signal system, in combination, a track circuit section, a calling on signal adjacent the rear end of said track section, and a track circuit releasing section the circuit of said releasing section comprising a relay back contact adapted to operate upon said releasing section being occupied, said calling on signal being adapted to be operated upon the operation of said back contact when said track section is occupied, one rail in each of said sections being adapted for use for the signal track circuit of said section only, and the second rail in each section being adapted for common use for the power current return and return of signal track circuit current.

33. In a railway automatic signal system in combination, a track section, a calling on signal adjacent the rear end of said track section, an overlap section for said track section, and a track circuit releasing section, the circuit of said releasing section comprising a relay back contact adapted to operate upon said releasing section being occupied, said calling on signal being adapted to operate upon the operation of said back contact when said overlap section is occupied, one rail in each of said sections being adapted for use for the signal track circuit of said section only, and the second rail in each section being adapted for common use for the power current return and return of signal track circuit current.

34. In a railway automatic signal system, in combination, a track circuit section, a calling on signal adjacent the rear end of said track section, a track circuit releasing section, and a train control device located in advance of said releasing section, said calling on signal being adapted to be operated and said control device to be released upon said releasing section being occupied when said track section is occupied, one rail in each of said sections being adapted for use for the signal track circuit of said section only, and the second rail in each section being adapted for common use for the power current return and return of signal track circuit current.

35. In a railway automatic signal system, in combination, a track circuit section, a calling on signal adjacent the rear end of said track section, an overlap section for said track section, a track circuit releasing section, and a train control device located in advance of said releasing section, said calling on signal being adapted to be operated and said control device to be released upon said releasing section being occupied when said overlap section is occupied, one rail in each of said sections being adapted for use for the signal track circuit of said section only, and

the second rail in each section being adapted for common use for the power current return and return of signal track circuit current.

36. In a railway automatic signal system in combination, a track circuit section, a calling on signal adjacent the rear end of said section, and a track circuit releasing section, said signal being adapted to be operated upon said releasing section being occupied when said track section is occupied, both rails in each of said sections of track being adapted for use for the signal track circuit current of said section only and for common use for the power current return.

37. In a railway automatic signal system in combination, a track circuit section, a calling on signal adjacent the rear end of said track section, an overlap section for said track section, and a track circuit releasing section, said signal being adapted to be operated upon said releasing section being occupied when said overlap section is occupied, both rails in each of said sections of track being adapted for use for the signal track circuit current of said section only and for common use for the power current return.

38. In a railway automatic signal system in combination, a track circuit section, a calling on signal adjacent the rear end of said track section, and a track circuit releasing section, the circuit of said releasing section comprising a relay back contact adapted to operate upon said releasing section being occupied, said calling on signal being adapted to be operated upon the operation of said back contact when said track section is occupied, both rails in each of said sections of track being adapted for use for the signal track circuit current of said section only and for common use for the power current return.

39. In a railway automatic signal system in combination, a track circuit section, a calling on signal adjacent the rear end of said track section, an overlap section for said track section, and a track circuit releasing section, the circuit of said releasing section comprising a relay back contact adapted to operate upon said releasing section being occupied, said calling on signal being adapted to be operated upon the operation of said back contact when said overlap section is

occupied, both rails in each of said sections of track being adapted for use for the signal track circuit current of said section only and for common use for the power current return.

40. In a railway automatic signal system, in combination, a track circuit section, a calling on signal adjacent the rear end of said track section, a track circuit releasing section, and a train control device located in advance of said releasing section, said calling on signal being adapted to be operated and said control device to be released upon said releasing section being occupied when said track section is occupied, both rails in each of said sections of track being adapted for use for the signal track circuit current of said section only and for common use for the power current return.

41. In a railway automatic signal system, in combination, a track circuit section, a calling on signal adjacent the rear end of said track section, an overlap section for said track section, a track circuit releasing section, and a train control device located in advance of said releasing section, said calling on signal being adapted to be operated and said control device to be released upon said releasing section being occupied when said overlap section is occupied, both rails in each of said sections of track being adapted for use for the signal track circuit current of said section only and for common use for the power current return.

42. In a railway automatic signal system in combination, a track section, a calling on signal adjacent the rear end of said section, and a track circuit releasing section, the circuit of said section comprising a relay adapted to be actuated by an alternating electric current, and to be operated upon said releasing section being occupied when said track section is occupied, said calling on signal being adapted to operate upon the operation of said relay.

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

WILLIAM H. ELLIOTT.

Witnesses:

RICHARD B. CARDWAY,
T. E. HARDENBUGH, JR.