

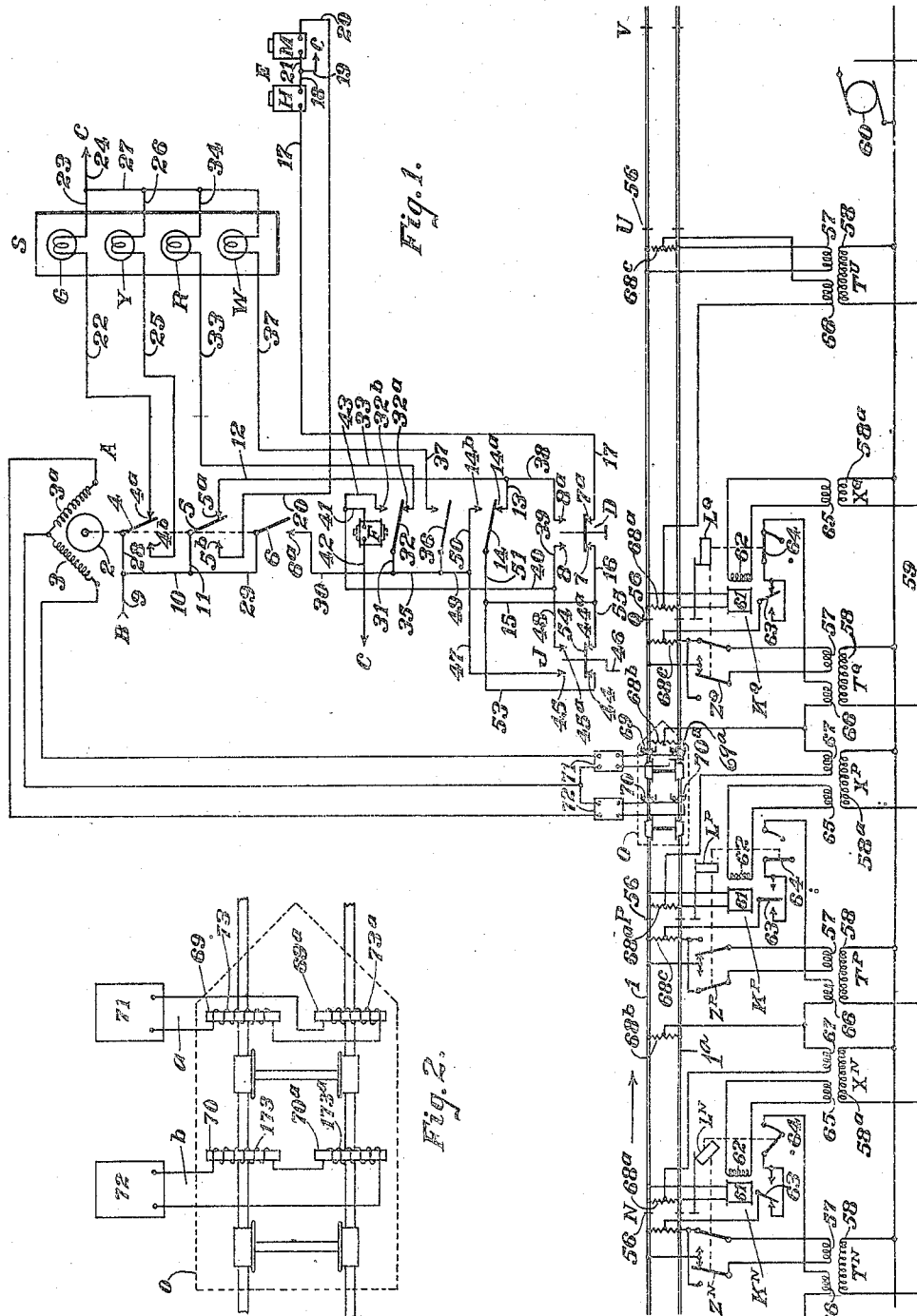
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L. V. LEWIS ET AL

RAILWAY TRAFFIC CONTROLLING APPARATUS

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RAILWAY TRAFFIC-CONTROLLING APPARATUS.

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To all whom it may concern:

Be it known that we, LLOYD V. LEWIS and FRANK H. NICHOLSON, citizens of the United States, residing at Edgewood Borough and Wilkesburg, respectively, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Railway Traffic-Controlling Apparatus, of which the following is a specification.

Our invention relates to railway traffic controlling apparatus, and particularly to apparatus of the type comprising speed governing means on a vehicle requiring the continuous supply of energy from the trackway to permit unretarded progress of the vehicle.

One feature of our invention is the provision of novel means for permitting unretarded progress of the vehicle along a portion of track which is not equipped for supplying such energy to the vehicle, which portion may be termed "nonpositive control territory," to distinguish it from "positive control territory" which is equipped for supplying energy to the vehicle.

We will describe one form of apparatus embodying our invention, and will then point out the novel features thereof in claims.

In the accompanying drawing, Fig. 1 is a diagrammatic view showing one form of apparatus embodying our invention, and Fig. 2 is a view showing on an enlarged scale the vehicle carried receiving coils and receiving circuits shown in Fig. 1.

Similar reference characters refer to similar parts in each of the views.

Referring to the drawing, the reference characters 1 and 1^a designate the track rails of a railway along which traffic normally moves in the direction indicated by the arrow. The stretch of track here shown includes a positive control territory N—U, and a non-positive control territory U—V, the former being equipped for supplying governing energy to vehicles while the latter is not so equipped.

The positive control territory N—U is divided, by insulated joints 56 in the track rails, into a plurality of track sections N—P, P—Q, and Q—U, each of which sections is provided with a track circuit comprising a source of current and a track relay. As here shown, the source of current for each track circuit is the secondary 57 of a transformer designated by the reference character T with an exponent corresponding to the location. The primary 58 of each of these transformers is connected with a transmission line 59 which is constantly supplied with alternating current by a generator 60. The relay for each section is designated by the reference character K with an exponent corresponding to the location, and comprises a winding 61 connected across the track rails of the section, and a co-operating winding 62 constantly supplied with alternating current by the secondary 65 of an adjacent transformer X the primary 58^a of which is connected with the transmission line 59. Each relay includes a contact 63 which occupies an intermediate position when the relay is de-energized and is swung to the right or to the left according as track winding 61 is supplied with current of one instantaneous relative polarity or the other.

Located adjacent the entrance end of each track section is a roadside signal designated by the reference character L with an exponent corresponding to the location. Each of these signals is controlled by the associated track relay K in a usual and well known manner, but inasmuch as the control of the signal has nothing to do with our present invention, we have omitted the controlling circuits from the drawings in order to simplify the disclosure as much as possible. Suffice it to say, that when a track relay is de-energized, the associated signal indicates "stop"; when the track relay is energized by track current of reverse relative polarity (that is, when contact 63 is swung to the left), the signal indicates "caution"; and when the relay is energized by track current

of normal relative polarity (that is, when the contact 63 is swung to the right), the signal indicates "proceed".

Interposed in each track circuit between the transformer secondary 57 and the track rails is a pole-changer which is designated by the reference character Z with an exponent corresponding to the location. Each of these pole-changers is operated by the adjacent signal L in such manner that current of normal relative polarity is supplied to the track rails when the signal indicates proceed or caution, and current of reverse relative polarity is supplied to the track rails when the signal indicates stop.

The apparatus thus far referred to is constructed and arranged in accordance with well known principles of railway signaling, and the operation of this portion of the apparatus will be understood without further explanation.

Each track section in the positive control territory is provided with means for supplying line current to the track rails. For this purpose a resistance 68^a is connected across the track rails at the entrance end of the section, a second resistance 68^b is connected across the rails at approximately maximum braking distance from the exit end of the section, and a third resistance 68^c is connected across the rails at the exit end of the section. Line current is constantly supplied to the rails of each section between resistances 68^a and 68^b by means of a secondary 67 on the adjacent transformer X, the terminals of which secondary are connected with the middle points of these two resistances, respectively. Line current is also at times supplied to the rails of each section between resistances 68^b and 68^c by a secondary 66 on the adjacent transformer T. One terminal of secondary 66 is constantly connected with the middle point of resistance 68^b, while the other terminal is at times connected with the middle point of resistance 68^c through contact 63 of the track relay K for the section next in advance and also through a contact 64 operated by the signal L for such section next in advance, contact 64 being closed when the signal indicates proceed or caution, and open when the signal indicates stop.

It will be seen from the foregoing, that line current is always supplied to the rear portion of each track section, whereas such current is supplied to the forward portion between resistances 68^b and 68^c when the next section is unoccupied, but not when such section is occupied.

The only exceptions to the arrangement of trackway apparatus just specified are that the last section Q—U in the positive control territory is constantly supplied with track circuit current of normal relative polarity, in that there is no pole-changer between the

rails of this section of the secondary 57 of transformer T^U, and this section is also constantly supplied with line current throughout the entire section by secondary 66 of transformer T^U. The reasons for this special arrangement of apparatus in section Q—U will appear hereinafter.

The reference character O designates a railway vehicle, which may be either a car or a train. Mounted on this vehicle (see Fig. 2) in front of the forward axle are two magnetizable cores 69 and 69^a located directly above the track rails 1 and 1^a, respectively. The cores 69 and 69^a are provided with windings 73 and 73^a which are connected in a receiving circuit *a* in such manner that the currents induced in these windings by track circuit current from transformer secondaries 57 are cumulative, whereas the currents induced in these windings by line currents from secondaries 66 and 67 are in opposition and therefore create no current in circuit *a*. Also mounted on the vehicle O in a suitable position, such as in the rear of the forward axle, are two other magnetizable cores 70 and 70^a, located directly above the track rails 1 and 1^a, respectively. These cores are provided with windings 173 and 173^a, which are included in a receiving circuit *b* in such manner that the currents induced in these windings by line current in the track rails are cumulative, whereas the currents induced in these windings by track circuit current in the track rails oppose each other and therefore create no current in the circuit *b*.

The reference character A designates a relay carried by the vehicle O, and which we will term the main relay. As here shown, this relay is of the induction motor type, comprising a rotor 2 and two stator windings 3 and 3^a. The windings 3 and 3^a are controlled by the energy created in circuits *a* and *b* respectively, by currents in the track rails. Interposed between the receiving circuit *a* and the relay winding 3 is an amplifying device 71, and interposed between receiving circuit *b* and relay winding 3^a is another amplifying device 72. These amplifying devices may be of any suitable form and they are not illustrated in detail herein because they form no part of our present invention. The rotor 2 of relay A operates three circuit controlling contact fingers 4, 5 and 6. The control of relay A is such that when line current is supplied to the receiving circuit *b* and track circuit of normal relative polarity is supplied to receiving circuit *a*, the contact fingers are swung to the right, which we will term the "normal" position, whereas, when the receiving circuit *b* is energized and the receiving circuit *a* is energized by track circuit current of reverse relative polarity the contact fingers are swung to the left, which we will term the

"reverse" position. When either receiving circuit *a* or *b* is de-energized, the relay A is de-energized, so that its contact fingers occupy their vertical positions. It will be seen at once from the foregoing that when the vehicle is traveling under a proceed signal, the main relay A is energized in normal direction, and that when the vehicle is traveling under a caution signal this relay will be energized in reverse direction, whereas, after the vehicle passes the resistance 68^b in a caution block, relay A will become de-energized due to the loss of line current.

The main relay A controls speed governing mechanism represented by the reference character E, which mechanism comprises a high speed magnet H and a medium speed magnet M. The complete mechanism E is not illustrated in the drawing for the reason that it forms no part of our invention. This mechanism is so constructed, however, that when the high speed magnet H is energized, the vehicle may proceed at full speed, such for example as 60 miles per hour; when the high speed magnet H is de-energized and the medium speed magnet M is energized, the vehicle may proceed at an intermediate speed such as 35 miles per hour; and when both magnets are de-energized a brake application will be incurred if the vehicle exceeds a fixed low speed, such for example, as 15 miles per hour.

The speed governing mechanism E is controlled by the main relay A, and also by an auxiliary relay F, as well as by a manually operable circuit controller D. The auxiliary relay F is slow-releasing in character and is normally de-energized. The circuit controller D, as here shown, is a push button comprising back contacts 7—7^a which are normally closed, and front contacts 8 and 8^a which are closed when the button is actuated by the engineer or operator of the vehicle.

The high speed magnet H is provided with a primary circuit controlled by the normal contact 5—5^a of relay A, this circuit being as follows: From terminal B of a suitable source of current, through wires 9, 10 and 11, normal contact 5—5^a of the main relay A, wires 12 and 13, back contact 14—14^a of the auxiliary relay F, wires 51, 15 and 16, back contacts 7—7^a of push button D, wire 17, magnet H, and wires 18 and 19 to terminal C of the same source of current. This circuit is closed only when relay F is open, push button D is in normal position, and the main relay A is energized in normal direction, that is when traffic conditions in advance of the vehicle are such that unretarded progress of the vehicle is permissible.

The medium speed magnet M is controlled by a reverse contact 5—5^b of relay A, the circuit for this magnet being from terminal

B, through wires 9, 10 and 11, contact 5—5^b, wire 20, magnet M, and wires 21 and 19 to terminal C. This circuit will, of course, be closed only when the vehicle is proceeding under a caution indication.

In the form of apparatus here shown the vehicle is further provided with a cab signal S comprising four electric lamps G, Y, R and W. The lamps G, Y and R are controlled by the main relay A in such manner as to indicate traffic conditions in advance; the lamp G when illuminated indicates "proceed" or high speed, the lamp Y when illuminated indicates "caution" or medium speed, and the lamp R when illuminated indicates low speed. The fourth lamp W is what we will term a cut-out lamp, and is provided to indicate to the engineer when the speed governing mechanism E is cut out of service as hereinafter explained.

The circuit for the high speed cab signal lamp G is from terminal B, through wires 9 and 28, normal contact 4—4^a of relay A, wire 22, lamp G, and wires 23 and 24 to terminal C. The circuit for the medium speed lamp Y is from terminal B, through wires 9 and 28, reverse contact 4—4^b of relay A, wire 25, lamp Y and wires 26, 27 and 24 to terminal C. The circuit for the low speed lamp R is from terminal B, through wires 9, 10 and 29, back contact 6—6^a, wires 30 and 31, back contact 32—32^a of relay F, wire 33, lamp R, and wires 34, 27 and 24 to terminal C. It will be seen, therefore, that lamp G is lighted when relay A is energized in normal direction, lamp Y is lighted when relay A is energized in the reverse direction, and lamp R is lighted when relay A is de-energized, provided that relay F is also de-energized.

The auxiliary relay F is provided with a pick-up circuit which passes from terminal B, through wires 9, 10 and 11, normal contact 5—5^a of relay A, wires 12 and 38, contacts 8—8^a of push button D, wires 39, 40 and 41, winding of relay F, and wire 42 to terminal C. It will be observed that this circuit can be closed only when the main relay A is energized in normal direction. The auxiliary relay F is further provided with a stick or holding circuit which passes from terminal B, through wires 9, 10 and 29, back contact 6—6^a of relay A, wires 30 and 31, front contact 32—32^b of relay F, wires 43 and 41, winding of relay F, and wire 42 to terminal C. This circuit can be closed only when relay F is closed and relay A is de-energized.

When relay F is closed an auxiliary circuit for the high speed magnet H is closed, which circuit passes from terminal B, through wires 9, 10 and 29, back contact 6—6^a of relay A, wires 30, 35, 49 and 50, front contact 14—14^b of relay F, wires 51, 15 and 16, back contacts 7—7^a of push but-

ton D, wire 17, magnet H, and wires 18 and 19 to terminal C. It follows, therefore, that while relay F is closed and relay A is de-energized, the vehicle may proceed at full speed. At such times, that is, while relay F is closed, the white lamp W of the cab signal S is lighted by virtue of a circuit which passes from terminal B, through wires 9, 10 and 29, back contact 6—6^a, wires 30 and 35, front contact 36 of relay F, wire 37, lamp W, and wires 27 and 24 to terminal C. This lamp then gives the engineer or driver of the vehicle a constant indication of the fact that the automatic control of the vehicle is eliminated.

The operation of the apparatus is as follows:

When the vehicle approaches the end of positive control territory, that is, the end of section Q—U, the engineer will reverse push button D while relay A is still energized in normal direction, thereby closing the pick-up circuit for relay F. The push button D must be held in the reverse position until the vehicle actually enters non-positive control territory, that is, until relay A becomes de-energized; when this occurs, the holding circuit for relay F is closed, because back contact 6—6^a of relay A is then closed and contact 32—32^b of relay F is already closed. Push button D may then be released and relay F will remain energized. The auxiliary circuit for the high speed magnet H is then closed, so that in spite of the fact that relay A is de-energized, the train may proceed into and through the non-positive control territory at full speed without incurring an automatic application of the brakes.

Inasmuch as both circuits for the high speed magnet H include the back contact of the push button D, it follows that magnet H is de-energized while this button D is held in the reverse position by the engineer. The speed governing and brake control mechanism E is so designed, however, that if the push button D is not held in reverse position for a time interval greater than that determined by a "delayed brake application" device, the brakes will not be applied, even though the circuit for magnet H is open at contact 7—7^a. This delayed brake application device forms no part of our present invention, and, consequently, is not illustrated in the drawing. Such a device is fully disclosed and claimed in a co-pending application filed by Frank H. Nicholson on or about the 14th day of July, 1921, Serial No. 484759, for Railway traffic controlling apparatus. It is sufficient for purposes of the present application to state that by virtue of this device an automatic application of the brakes, due to de-energization of magnet H, is delayed for an interval of time which is approximately inversely proportional to

the actual speed of the vehicle. This device, therefore, permits the engineer to hold push button D in the reverse position for an interval of time which is approximately inversely proportional to the speed of the vehicle without incurring an automatic application of the brakes, and, consequently, it makes it incumbent upon the engineer to operate the push button D at a point only a short distance from the place where positive control territory ends and non-positive control territory begins. In other words, the operation of push button D, if a brake application is to be avoided, is restricted to a short space at the end of positive control territory, and the higher the speed the shorter this space becomes.

It will be noted that the pick-up circuit for relay F includes a normal contact of relay A, but not a reverse contact of this relay. It follows from this that the engineer cannot pick up relay F when approaching a stop signal, because at such times relay A is energized in the reverse direction, and, consequently, the pick-up circuit for auxiliary relay F is open at contact 5—5^a of relay A.

It will also be observed that the holding circuit for relay F includes back contact 6—6^a of relay A. It follows from this that the stick or holding circuit for relay F cannot be closed while the vehicle is traveling under a proceed indication. If the engineer reverses push button D under such conditions, relay F will become energized, but will again become de-energized immediately upon release of the push button D. If the engineer holds push button D in reversed position for more than a given interval of time, determined by the delayed brake application device, then magnet H will become de-energized because its circuit is opened at contact 7—7^a of push button D, and so the low speed limit will be imposed on the vehicle.

It will be obvious that when the vehicle leaves a portion of track equipped with positive control apparatus and enters a branch line not so equipped, the automatic governing apparatus may be cut out of service in the same manner as when the vehicle passes from positive control territory to non-positive control territory on the same track.

The only condition under which relay A changes from its normal energization to its de-energized condition while the vehicle is in positive control territory is when the supply of vehicle governing current to the transmission line 59 fails. Obviously, however, the engineer does not know when such failure is going to occur, and so he is unable to pick up relay F at such time by the operation of push button D. One purpose of the circuit controller J (hereinafter explained) is to permit the vehicle to proceed

without undue delay when such failure occurs.

The conditions under which the brake application mechanism can be actuated are the same as the signal conditions at a medium speed crossover, and, consequently, the engineer may utilize the relay F in making a crossover move of this character. He may also utilize this relay while entering or leaving congested terminal territory, while operating over temporary routes or detours, or while passing over other sections of track where it may be desirable on account of emergency conditions to provide for expeditious movement of traffic without automatic control by traffic conditions in advance.

It may be desirable in some instances to provide means under the control of the engineer for closing relay F after entering non-positive control territory or after an emergency event, such as the failure of power or the failure of some part of the electrical apparatus. To permit this, we may provide a slow acting manually operable circuit controller J and an auxiliary pick-up circuit for relay F controlled by front contacts 45-45^a of this circuit controller. The circuit controller J may be so designed that the bridge member 54 can be moved from its normal position (in which it is shown in the drawing) to its reverse position in a short interval of time, but that the return movement to normal position requires a considerable time interval, such as from one to four minutes. When circuit controller J has been reversed, the following pick-up circuit for relay F is closed. From terminal B, through wires 9, 10 and 29, back contact 6-6^a of relay A, wires 30, 35, 49 and 47, contact 45-54-45^a of circuit controller J, wires 48, 40 and 41, winding of relay F, and wire 42 to terminal C. The holding circuit for relay F is then the same as before. When the slow acting controller J is provided, wire 15 is omitted from the circuits for magnet H, so that these circuits then pass from wire 51 through wire 53, contact 44-54-44^a of controller 5, and wire 55 to wire 16. It will be seen, therefore, that after the circuit controller J has been operated to close relay F the circuit of magnet H will be opened at contact 44-54-44^a, and, provided relay A remains de-energized, a time interval of from one to four minutes will elapse before magnet H can become energized, that is, before this contact can be closed.

When the vehicle re-enters positive control territory, the main relay A will become energized in either normal or reverse direction, and the opening of the back contact of this relay will de-energize the auxiliary relay F, thereby automatically restoring the parts of the apparatus to their nor-

mal conditions. If the train control system is not in proper working order, however, relay F will continue to be energized and the engineer will be apprised of the fact by the continued burning of lamp W.

Although we have herein shown and described only one form of apparatus embodying our invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of our invention.

Having thus described our invention, what we claim is:

1. Railway traffic controlling apparatus comprising mechanism on a vehicle requiring the continuous supply of energy from the trackway to permit unretarded progress of the vehicle, and means on said vehicle including a manually operable device for removing said mechanism from control by trackway energy to permit the vehicle to pass without retardation through territory not equipped for supplying energy to the vehicle, said means being effective only if the manually operable device is actuated just before the supply of energy from the trackway ceases.

2. Railway traffic controlling apparatus comprising a vehicle, a relay thereon controlled by energy received from the trackway and requiring a continuous supply of such energy to keep the relay energized, vehicle governing mechanism controlled by said relay and requiring that the relay be energized to permit unretarded progress of the vehicle, and means on said vehicle including a manually operable device for causing said vehicle governing mechanism to permit unretarded progress of the vehicle when said relay is de-energized provided that said device is actuated just before said relay becomes de-energized.

3. Railway traffic controlling apparatus comprising a vehicle, a relay thereon controlled by energy received from the trackway and requiring a continuous supply of such energy to keep the relay energized, speed governing mechanism controlled by said relay and requiring that the relay be energized to permit full speed, and means including a manually operable circuit controller for causing said speed governing mechanism to permit full speed when said relay is de-energized provided that said circuit controller is actuated before said relay becomes de-energized.

4. Railway traffic controlling apparatus comprising a vehicle, a relay thereon controlled by energy received from the trackway and requiring a continuous supply of such energy to keep the relay energized, vehicle governing mechanism controlled by said relay and requiring that the relay be energized to permit unretarded progress of

the vehicle, and means including a slow-acting manually operable circuit controller for causing said vehicle governing mechanism to permit unretarded progress of the vehicle when said relay is de-energized.

5 5. Railway traffic controlling apparatus comprising a vehicle, a main relay thereon controlled by energy received from the trackway and requiring a continuous supply
10 of such energy to keep the relay energized, vehicle governing mechanism controlled by said main relay and requiring that the relay be energized to permit unretarded progress of the vehicle, and means including an aux-
15 iliary relay on said vehicle for causing said vehicle governing mechanism to permit unretarded progress when said auxiliary relay is energized and said main relay is de-energized, and means on the vehicle including
20 a manually operable device for energizing said auxiliary relay provided that said device is operated while the main relay is closed and for subsequently keeping said auxiliary relay energized if the main relay
25 is open.

6. Railway traffic controlling apparatus comprising a vehicle, a main relay thereon controlled by energy received from the trackway and requiring a continuous supply
30 of such energy to keep the relay energized, speed governing mechanism controlled by said main relay and requiring that the relay be energized to permit full speed, an aux-
35 iliary relay on said vehicle, manually operable means on the vehicle for energizing said auxiliary relay, means for causing said speed governing mechanism to permit full
40 speed when said auxiliary relay is energized and said main relay is de-energized, and a cut-out signal controlled by said auxiliary relay.

7. Railway traffic controlling apparatus comprising a main relay on a vehicle controlled by energy received from the track-
45 way and energized in normal or reverse direction under high speed or medium speed traffic conditions, respectively, and de-energized under low-speed traffic conditions as well as when the vehicle is traversing non-
50 positive control territory; speed governing mechanism controlled by said relay for permitting high, medium, or low speed according as the relay is energized in normal or reverse direction or is de-energized; an aux-
55 iliary relay on said vehicle, a pick-up circuit for said auxiliary relay including a manually operable circuit controller and a normal contact of said main relay, a holding circuit for said auxiliary relay including a
60 contact closed when said main relay is de-energized, and means for causing said speed governing mechanism to permit high speed when said auxiliary relay is energized.

8. Railway traffic controlling apparatus
65 comprising a main relay on a vehicle con-

trolled by energy received from the trackway and energized in normal or reverse direction under high speed or medium speed traffic conditions respectively, and de-energized under low speed traffic conditions as
70 well as when the vehicle is traversing non-positive control territory; speed governing mechanism controlled by said relay for permitting high, medium or low speed according as the relay is energized in normal or
75 reverse direction or is de-energized; an auxiliary relay on said vehicle, a pick-up circuit for said auxiliary relay including a manually operable circuit controller and a normal contact of said main relay, a holding
80 circuit for said auxiliary relay including a contact closed when said main relay is de-energized, a second pick-up circuit for said auxiliary relay including a slow-acting manually operable circuit controller and a
85 contact closed when said main relay is de-energized, and means for causing said speed governing mechanism to permit high speed when said auxiliary relay is energized.

9. Railway traffic controlling apparatus
90 comprising a main relay on a vehicle controlled by energy received from the trackway and energized in normal or reverse direction under high speed or medium speed traffic conditions, respectively, and de-
95 energized under low speed traffic conditions as well as when the vehicle is traversing territory not equipped with means for supplying such energy, an auxiliary relay on the vehicle, a quick-acting manually operable
100 circuit controller on said vehicle; speed governing mechanism on said vehicle including a high speed magnet controlled by a normal contact of said main relay, a back contact of said auxiliary relay and a back contact of
105 said circuit controller; said mechanism also including a medium speed magnet controlled by a reverse contact of said main relay, a pick-up circuit for said auxiliary relay including a normal contact of said main re-
110 lay and a back contact of said circuit controller, a holding circuit for said auxiliary relay including a back contact of said main relay, and a branch for the circuit of said high speed magnet around said back con-
115 tact of said auxiliary relay and said normal contact of said main relay and including a front contact of the auxiliary relay and a back contact of the main relay.

10. Railway traffic controlling apparatus
120 comprising a main relay on a vehicle controlled by energy received from the trackway and energized in normal or reverse direction under high speed and medium speed traffic conditions, respectively, and de-
125 energized under low speed traffic conditions as well as when the vehicle is traversing territory not equipped with means for supplying such energy, an auxiliary relay on the vehicle, a quick-acting manually operable
130

circuit controller on said vehicle; speed governing mechanism on said vehicle including a high speed magnet controlled by a normal contact of said main relay, a back contact of said auxiliary relay and a back contact of said circuit controller; said mechanism also including a medium speed magnet controlled by a reverse contact of said main relay, a pick-up circuit for said auxiliary relay including a normal contact of said main relay and a back contact of said circuit controller, a holding circuit for said auxiliary relay including a back contact of said main relay, a slow-acting manually operable circuit controller on said vehicle, a second pick-up circuit for said auxiliary relay including a front contact of said slow-acting circuit controller and a back contact of said main relay, a branch for the circuit of said high speed magnet around said auxiliary relay back contact and said main relay normal contact, said branch including a front contact of said auxiliary relay and a back contact of said main relay.

11. Railway traffic controlling apparatus comprising a main relay on a vehicle controlled by energy received from the trackway and energized in normal or reverse direction under high speed and medium speed traffic conditions, respectively, and de-energized under low speed traffic conditions as well as when the vehicle is traversing non-positive control territory, speed governing mechanism controlled by said relay for permitting high, medium or low speed according as the relay is energized in normal or reverse direction or is de-energized, and manually operable means for causing said speed governing mechanism to permit high speed when said relay is de-energized.

12. Railway traffic controlling apparatus comprising a main relay on a vehicle controlled by energy received from the trackway and energized in normal or reverse direction under high speed and medium speed traffic conditions, respectively, and de-energized under low speed traffic conditions as well as when the vehicle is traversing non-positive control territory, speed governing mechanism controlled by said relay for permitting high, medium or low speed according as the relay is energized in normal or reverse direction or is de-energized, and means including a quick-acting manually operable circuit controller for causing said speed governing mechanism to permit high speed when said relay is de-energized provided that said circuit controller is actuated while said relay is energized in normal direction.

13. Railway traffic controlling apparatus comprising a main relay on a vehicle controlled by energy received from the trackway and energized in normal or reverse direction under high speed and medium speed

traffic conditions, respectively, and de-energized under low speed traffic conditions as well as when the vehicle is traversing non-positive control territory, speed governing mechanism controlled by said relay for permitting high, medium or low speed according as the relay is energized in normal or reverse direction or is de-energized, and means including a slow-acting manually operable circuit controller for causing said speed governing mechanism to permit high speed when said relay is de-energized.

14. Railway traffic controlling apparatus comprising a trackway having positive control territory equipped with means for supplying vehicle governing energy to vehicles and non-positive territory not so equipped, a main relay on a vehicle controlled by energy received from the trackway and having front and back contacts closed, respectively, when the relay is energized and de-energized, a normally de-energized auxiliary relay on said vehicle, a manually operable circuit controller on the vehicle having a normally closed back contact and a normally open front contact, a pick-up circuit for said auxiliary relay including a front contact of the main relay and the front contact of said manually operable circuit controller, a holding circuit for said auxiliary relay including a back contact of the main relay, speed governing mechanism on the vehicle including a magnet normally controlled by the back contact of said manually operable circuit controller and a front contact of said main relay, and an auxiliary circuit for said magnet controlled by a front contact of said auxiliary relay and a back contact of said main relay and said back contact of the manually operable circuit controller.

15. Railway traffic controlling apparatus comprising a trackway having positive control territory equipped with means for supplying vehicle governing energy to vehicles and non-positive control territory not so equipped, a vehicle provided with a main relay controlled by vehicle governing energy received from the trackway and having front and back contacts closed respectively when the relay is energized and de-energized, a normally de-energized auxiliary relay on said vehicle, a manually operable circuit controller on said vehicle having a normally closed back contact and a normally open front contact, a pick-up circuit for said auxiliary relay controlled by a front contact of said main relay and the front contact of said manually operable circuit controller, a holding circuit for said auxiliary relay controlled by a back contact of said main relay, speed governing mechanism on said vehicle normally controlled by the back contact of said circuit controller and a front contact of said main relay, and means

effective when said auxiliary relay is energized for removing said mechanism from control by a front contact of the main relay.

16. Railway traffic controlling apparatus comprising a trackway having positive control territory equipped with means for supplying vehicle governing energy to vehicles and non-positive control territory not so equipped, a vehicle provided with a main relay controlled by vehicle governing energy received from the trackway and having front and back contacts closed respectively, when the relay is energized and de-energized, a normally de-energized auxiliary relay on said vehicle, a manually operable circuit controller on said vehicle having a normally closed back contact and a normally open front contact, a pick-up circuit for said auxiliary relay controlled by a front contact of said main relay and the front contact of said manually operable circuit controller, a holding circuit for said auxiliary relay controlled by a back contact of said main relay, speed governing mechanism on said vehicle normally requiring that said main relay be energized and that the back contact of said circuit controller be closed to permit unretarded progress of the vehicle, and means effective to permit unretarded progress of the vehicle when said main relay is de-energized provided that said auxiliary relay is energized and the back contact of said circuit controller is closed.

17. Railway traffic controlling apparatus comprising a trackway having positive control territory equipped with means for supplying vehicle governing energy to vehicles and non-positive control territory not so equipped, a vehicle provided with a main relay controlled by vehicle governing energy received from the trackway and having front and back contacts closed respectively, when the relay is energized and de-energized, a normally de-energized auxiliary relay on said vehicle, a manually operable circuit controller on said vehicle having a normally closed back contact and a normally open front contact, speed governing mechanism on said vehicle normally requiring that the front contact of said main relay and the back contact of said circuit controller be closed to permit unretarded progress of the vehicle, means for closing said auxiliary relay when the front contact of said circuit controller is closed and said main relay is energized, means for subsequently keeping said auxiliary relay closed if the main relay is de-energized, and means effective to permit unretarded progress of the vehicle when said main relay is open provided said auxiliary relay and the back contact of said circuit controller are closed.

18. Railway traffic controlling apparatus comprising a trackway having positive control territory equipped with means for sup-

plying vehicle governing energy to vehicles and non-positive control territory not so equipped, the means in the positive control territory being arranged to supply energy to the vehicle of one relative polarity or the other according to proceed or caution traffic conditions in advance, a vehicle provided with a main relay controlled by energy received from the trackway and energized in normal or reverse direction according as such energy is of normal or reverse relative polarity, a normally de-energized auxiliary relay on said vehicle, a manually operable circuit controller on said vehicle having a normally closed back contact and a normally open front contact, speed governing mechanism on the vehicle normally requiring that the main relay be energized in normal direction and the back contact of said circuit controller be closed to permit unretarded progress of the vehicle, means for closing said auxiliary relay when the front contact of said circuit controller is closed and said main relay is energized in normal direction but not when said main relay is energized in reverse direction, means for subsequently keeping said auxiliary relay closed if the main relay is de-energized, and means effective to permit unretarded progress of the vehicle when said main relay is de-energized provided said auxiliary relay and the back contact of said circuit controller are closed.

19. Railway traffic controlling apparatus comprising a trackway having positive control territory equipped with means for supplying vehicle governing energy to vehicles and non-positive control territory not so equipped, the means in the positive control territory being arranged to supply energy to the vehicle of one relative polarity or the other according to proceed or caution traffic conditions in advance, a vehicle provided with a main relay controlled by energy received from the trackway and energized in normal or reverse direction according as such energy is of normal or reverse relative polarity, a normally de-energized auxiliary relay on said vehicle, a manually operable circuit controller on said vehicle having a normally closed back contact and a normally open front contact, speed governing mechanism on the vehicle normally requiring that the main relay be energized in normal direction and the back contact of said circuit controller be closed to permit unretarded progress of the vehicle, means for closing said auxiliary relay when the front contact of said circuit controller is closed and said main relay is energized in normal direction but not when said main relay is energized in reverse direction, means for subsequently keeping said auxiliary relay closed if the main relay is de-energized, and

means effective to permit unretarded progress of the vehicle when said main relay is de-energized provided said auxiliary relay and the back contact of said circuit controller are closed said speed governing mechanism being so designed that it does not retard progress of the vehicle while the back

contact of said circuit controller is open for a short period of time.

In testimony whereof we affix our signatures

LLOYD V. LEWIS.
FRANK H. NICHOLSON.