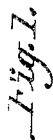


L. V. LEWIS.
RAILWAY TRAFFIC CONTROLLING APPARATUS.
APPLICATION FILED NOV. 25, 1918.

3 SHEETS—SHEET 1.



*Applies brakes
when de-energized*

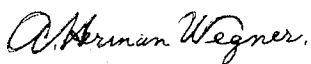
A. Hermann Wegner.
ERG

INVENTOR
Floyd V. Lewis
by W. R. Tuncill
Atty.

RAILWAY TRAFFIC CONTROLLING APPARATUS.

Patented May 3, 1921.

1,377,137.



Lloyd V. Lewis
by R. Z. Verrill
His Att'y.

Att'y.

L. V. LEWIS.

RAILWAY TRAFFIC CONTROLLING APPARATUS.

APPLICATION FILED NOV. 25, 1918.

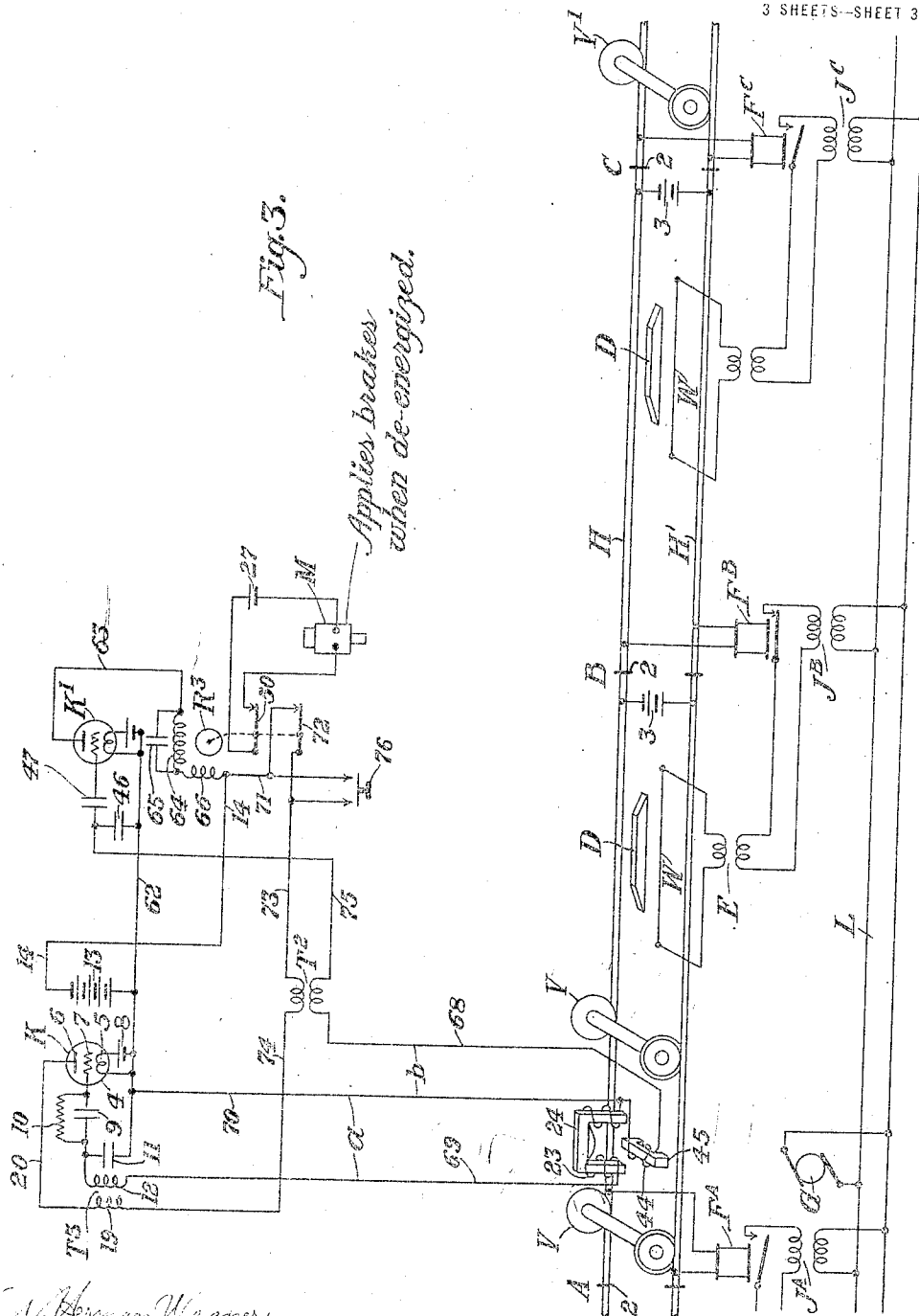
1,377,137.

Patented May 3, 1921.

3 SHEETS—SHEET 3.

Fig. 3.

Applies brakes
when de-energized.



C. V. Herman & Wagner.

[Signature]

Floyd V. Lewis
by A. R. Tennill

Att'y.

UNITED STATES PATENT OFFICE.

LLOYD V. LEWIS, OF EDGEWOOD BOROUGH, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

RAILWAY-TRAFFIC-CONTROLLING APPARATUS.

1,377,137.

Specification of Letters Patent.

Patented May 3, 1921.

Application filed November 25, 1918. Serial No. 263,969.

To all whom it may concern:

Be it known that I, LLOYD V. LEWIS, a citizen of the United States, residing at Edgewood Borough, 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.

My invention relates to railway traffic controlling apparatus, and has for an object the provision of simple and reliable means for transmitting to a railway vehicle indications of traffic conditions in advance without mechanical or electrical contact between devices on the vehicle and devices in the trackway.

I will describe three forms of apparatus embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is a diagrammatic view showing one form of railway traffic controlling apparatus embodying my invention. Figs. 2 and 3 are views similar to Fig. 1, but showing modifications of the vehicle-carried apparatus also embodying my invention.

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

Referring first to Fig. 1, the reference characters H and H' designate the track rails of a railway, which rails are divided into block sections A—B, B—C, etc., by insulated joints 2. Each section is provided with a track circuit comprising the two track rails of the section, a track battery 3, and a track relay designated by the reference character F with an exponent corresponding to the location of the relay. These track relays are employed to control the indications transmitted to the vehicles traveling along the railway, in a manner hereinafter explained.

Located in block section A—B is a vehicle V (a railway car or train) which is represented by two axles and two pairs of wheels. This vehicle is provided with apparatus which I will now describe.

Mounted on the vehicle is an electron tube K comprising a vacuum tube 4, containing a filament 5, a plate 6, and a grid 7

between the filament and the plate. The filament 5 is constantly heated to incandescence by a battery 8 through a circuit which is obvious from the drawing. Between the grid 7 and filament 5 an alternating difference of potential is maintained due to sustained oscillations in a circuit *a* which is tuned to resonance at a predetermined frequency, and the oscillations in this circuit *a* are in turn maintained by a portion of the energy output from the plate circuit of the electron tube K. Circuit *a* comprises a condenser 11 and the secondary 12 of a transformer T¹. The terminals of the condenser are connected with the filament and grid respectively of the electron tube K, a blocking condenser 9 being included in the connection as shown. A high resistance 10 is optionally connected in multiple with the condenser 9 for the purpose of limiting the amplitude of the oscillations in circuit *a*. The plate circuit for electron tube K is from a battery 13 through the filament, grid and plate of tube K, wire 20, primary 19 loosely coupled to secondary 12 of transformer T², wire 18, primary of transformer T, condenser 16 and winding 17 of a relay R in multiple, and wires 15 and 14 to battery 13. The electron tube K is thus connected in such manner that it acts as a generator of alternating current, of a frequency which is determined by the constants of circuit *a*. This frequency I will term the "given" frequency.

The plate circuit just traced is loosely coupled to a second oscillating circuit *b* by a transformer T, so that oscillations are sustained in circuit *b* by energy from the plate circuit. Circuit *b* includes the secondary of transformer T, a winding 21 of relay R, a condenser 22, and a coil 23 on a laminated soft iron core 24. The core 24 is U-shaped as shown, with its legs projecting downwardly, and the plane of the core is parallel to the track rails H and H'. Located at certain points in the trackway are bars D of soft iron, each of which bars is also parallel with the track rails, and is so positioned that it is directly under and close to the open ends of core 24 as the vehicle passes over the bar. The elements in circuit *b* are so proportioned that when core 24

is not influenced by a bar D, this circuit is resonant at the given frequency, so that oscillations of considerable amplitude then exist in circuit *b*. When core 24 passes over a trackway bar D, however, the reluctance of this core is considerably reduced, so that the inductance of coil 23 is greatly increased. Circuit *b* is then not resonant at the given frequency, hence the amplitude of the oscillations in this circuit is greatly reduced.

Relay R is of the induction motor type, comprising the two stator windings 17 and 21, a rotor 25, and a contact 26 which is operated by the rotor and closed only when the relay is effectively energized. Current is supplied to winding 17 directly from the electron tube K, and when circuit *b* is resonant at the same frequency as circuit *a*, current is also supplied to winding 21 of such value that the relay is effectively energized. Since circuit *b* is tuned to resonance, the current in winding 21 is evidently in phase with the alternating current in the plate circuit of electron tube K. Condenser 16 and winding 17 are tuned to resonance at the given frequency, so that the electromotive force across 17 is in phase with this current, and since winding 17 is inductive, the current through winding 17 will have greater amplitude and differ widely in phase from the total plate circuit current and hence will be in approximate quadrature with the current in winding 21. When, however, the core 24 passes over a trackway bar D so that the resonance of circuit *b* at the given frequency is destroyed, the current in relay winding 21 is reduced to such a degree that relay R is no longer effectively energized, and contact 26 then opens. Preferably the two windings 17 and 21 of relay R are made unequal, so that the larger portion of the total energy required to operate this relay is obtained directly from the plate circuit of the electron tube K, and but a small portion is obtained from circuit *b*. The effective resistance of circuit *b* may thus be kept at a low value and thereby sharp resonance obtained.

So far as concerns the apparatus thus far described, it will be seen that relay R is effectively energized to close its contact 26 at all times except when core 24 is directly over one of the trackway bars D. Relay R controls a relay R', which latter relay is provided with a pick-up circuit and a stick circuit. The stick circuit for relay R' is from a battery 27, through wires 28, 29, winding of relay R', wires 30 and 31, contact 32 of relay R', wire 33, contact 26 of relay R, and wire 34 to battery 27. It will be seen, therefore, that when relay R' is once closed or energized, it will remain energized as long as relay R is effectively energized, but that when relay R once be-

comes deenergized, owing to the opening of contact 26, relay R' will remain deenergized, even after contact 26 closes, until the pick-up circuit for relay R' becomes closed. The pick-up circuit for relay R' is controlled by a contact 35 of an induction motor relay R², the circuit being from battery 27, through wires 28 and 29, winding of relay R', wires 30 and 36, contact 35 of relay R², and wire 37 to battery 27. It follows that when relay R² is energized, relay R' will continue to be energized, regardless of the position of contact 26, or relay R' will become energized if it is then deenergized.

Relay R² is of the induction motor type comprising two stator windings 38 and 39. These windings are supplied with energy from the plate circuit of an electron tube K'. The plate circuit for electron tube K' is from battery 13, through wires 14 and 40, relay winding 38, relay winding 39 and condenser 41 in multiple, wire 42, electron tube K', and wire 43 to battery 13. The grid of the electron tube K' is provided with an oscillating circuit which is designated by the reference character *c*, and which circuit includes a winding 44 on a laminated soft iron core 45 and a condenser 46. This circuit *c* is tuned to resonance at a predetermined frequency, such as 60 cycles. The terminals of the condenser 46 are connected with the filament and grid, respectively, of electron tube K', a blocking condenser 47 being inserted in this connection, as shown. The core 45 is U-shaped, with its legs projecting downwardly, and is arranged transversely with respect to the track, as shown in the drawing. Located in the trackway adjacent each bar D is a conductor W, which is at times supplied with alternating current by means hereinafter explained. When the vehicle carried core 45 passes over a conductor W in which 60 cycle current is flowing, part of the magnetic lines of force surrounding the conductor pass through the core 45 and so induce an alternating potential in the coil 44, whereupon sustained oscillations are produced in the resonant circuit *c*. This produces an alternating difference of potential between the grid and filament of the electron tube K', whereby an alternating component is produced in the current in the plate circuit of K' which contains the windings of relay R². Since this relay R² is of the well known induction motor type, it is not affected by the continuous or steady component of the current in this circuit, but by reason of condenser 41 connected across the terminals of winding 39, the alternating components of the currents through windings 38 and 39 are displaced in phase to cause the rotor of relay R² to close its contact 35.

Relay R' controls a brake application magnet M, the circuit being from battery 27, through wires 28 and 48, winding of magnet M, wire 49, contact 50 of relay R', and wire 51 to battery 27. The magnet M controls brake application apparatus of any suitable form, in such manner that an automatic application of the brakes occurs whenever this magnet becomes deenergized.

Each block section is provided with one of the bars D, which bar is located at maximum braking distance in the rear of the entrance end of the section. Adjacent to each of the bars D is one of the conductors W, this conductor preferably extending a short distance beyond each end of the adjacent bar D. Each conductor is supplied at times with alternating current of suitable frequency (hereinbefore assumed to be 60 cycles), this supply being controlled by the track relay for the corresponding section. For example, the ends of the conductor W in the rear of point B are connected with the terminals of the secondary of a transformer E, and the circuit for the primary of this transformer is from the secondary of transformer J^B, through contact 52 of track relay F^B, wire 53, primary of transformer E, and wire 54 to the secondary of transformer J^B. Conductor W in the rear of location C is similarly supplied with current from a transformer J^C, this supply being controlled by track relay F^C. The primary of each transformer J is connected with a transmission line L, which line is constantly supplied with alternating current from a suitable source, such as a generator G.

The operation of the apparatus shown in Fig. 1, is as follows:

The section immediately in advance of location C being occupied by a vehicle V', track relay J^C is deenergized; but inasmuch as block section B—C is unoccupied, relay F^B is energized so that the conductor W controlled by this relay is supplied with alternating current. Vehicle V is assumed to have just entered block section A—B. Relay R on this vehicle is, of course, energized and it is also assumed that relay R' has been energized so that its stick circuit is held closed by contact 26. Brake magnet M is consequently energized, so that the vehicle is free to proceed into block section A—B. When the vehicle reaches such a position that the core 24 passes over the trackway bar D, relay R will become deenergized, so that its contact 26 will open. Just before this occurs, however, core 45 will pass into the magnetic field surrounding the conductor W, so that relay R² will become energized, thus closing at contact 35 the pick-up circuit for relay R'. This latter relay will, therefore, remain energized as long as relay R is deenergized, so that brake mag-

net M will continue to be energized and no automatic application of the brakes will occur. Vehicle V can, consequently, proceed into block section B—C without interference on the part of the automatic apparatus.

Inasmuch as track relay F^C is deenergized, the conductor W in the rear of location C is not supplied with current. It follows that when vehicle V reaches such point that its core 24 passes over the bar D in block section B—C, the consequent opening of contact 26 of relay R will permit stick relay R' to open, and that upon leaving the bar this stick relay will remain open, because its pick-up circuit is open at contact 35. The opening of relay R' will deenergize magnet M so that an automatic application of the brakes will immediately occur, so that the vehicle will be brought to a stop before it reaches location C.

In order to allow the vehicle to proceed after an automatic brake application has occurred, a push button 76 is provided which is normally open but which, when closed, closes a shunt around contact 35 of relay R² and so closes the pick-up circuit for relay R' even though relay R² is deenergized. This push button is preferably located at such a place on the vehicle that it is accessible only from the ground, thus requiring the vehicle to come to rest before the button can be operated. Assuming, then, that the vehicle has been brought to rest by an automatic application of the brakes, the operator descends to the ground and pushes button 76, thus energizing relay R'. This relay will then remain energized because its stick circuit is closed at contact 26. The closing of relay R' will energize magnet M so that the brakes will again be released and the vehicle may proceed.

In the system shown in Fig. 1, the frequency to which circuit *a* is tuned may be chosen so as to produce the maximum effect in circuit *b*, with a slight change in inductance of coil 23. The frequency to which circuits *a* and *b* are thus tuned is not, necessarily, the same as the frequency of the current supplied to the trackway conductors W. Circuit *c* may be so designed as to respond to a wide variation in the frequency of the current induced therein, so that relay R² will operate reliably when circuit *c* is supplied with energy from a commercial 60 cycle source of current subject to considerable variation in frequency.

Referring now to Fig. 2, the trackway apparatus shown in this view is the same as that shown in Fig. 1. As for the vehicle-carried apparatus, the cores 24 and 45 and the coils thereon are the same as those shown in Fig. 1, and the electron tube K is likewise the same. The grid circuit for electron tube K including the oscillat-

ing circuit *a* is the same as the corresponding circuit in Fig. 1, but the plate circuit is somewhat different. This plate circuit in Fig. 2 is from battery 13, through
 5 wires 14 and 55, primary of transformer T, wire 18, primary 19 of transformer T³, and wire 20 to plate 6, thence through the electron tube K to battery 13. Circuit *b* is
 10 loosely coupled with the plate circuit by transformer T, and is from the secondary of transformer T, through wire 56, contact 57 of a relay R³, wire 58, condenser 22, primary winding of a transformer T', wire 59, coil 23, and wire 60 to the secondary of
 15 transformer T. The circuit for the secondary of transformer T' constitutes the grid circuit for an electron tube K'. This circuit, which is designated *c*, is from the secondary of transformer T', through wire
 20 61, condenser 46, wires 62 and 60, coil 44, and wire 68 to the secondary of transformer T'. The plate circuit for electron tube K' is from battery 13, through wires 14 and 67, winding 66 of relay R³, winding 64
 25 of this relay and condenser 65 in multiple, wire 63, thence through electron tube K', and wire 62 to battery 13.

Relay R³ controls a brake application magnet M through the medium of contact
 30 50 in the same manner as the corresponding magnet M is controlled by relay R' in Fig. 1. The result is, that when relay R³ becomes deenergized, magnet M likewise becomes deenergized and causes an automa-
 35 tic application of the brakes.

As in Fig. 1, the electron tube K is so connected that it serves as a generator of alternating current, the frequency of which depends on the frequency to which circuit *a*
 40 is tuned (the "given" frequency). The current in the plate circuit of electron tube K produces alternating current of the same frequency in the loosely coupled oscillating circuit *b*, which circuit is normally tuned
 45 to resonance at the frequency of such current. Circuit *b* is coupled loosely with circuit *c* through the medium of transformer T', and circuit *c* is likewise tuned to resonance at the same frequency as circuit *a*.
 50 The current thus induced in circuit *c* produces an alternating difference of potential between the grid and filament of electron tube K', and thus produces an alternating current component of the same frequency in
 55 the plate circuit of electron tube K', this alternating component being of sufficient amplitude to effectively energize relay R³. When, however, core 24 passes over one of the trackway bars D, the resonance of circuit *b*
 60 at the given frequency is destroyed so that the current which then flows in this circuit is comparatively weak. The current which is then induced in circuit *c* is likewise weakened, so that the current in the plate circuit of electron tube K' is then insufficient

to effectively energize relay R³. The deenergization of relay R³ is prevented, however, if the adjacent conductor W is supplied with alternating current of the frequency to which circuit *c* is tuned. In this
 70 event, the sustained oscillations are maintained in circuit *c*, so that the plate circuit for electron tube K' carries alternating current of sufficient amplitude to energize relay R³ or to keep this relay energized if it
 75 is already in such condition.

It follows from the foregoing that the frequency of the current supplied to the trackway conductors W by generator G must be the same as that to which circuits
 80 *a*, *b* and *c* are tuned.

The operation of the apparatus as shown in Fig. 2 will now be obvious. As long as core 24 is not over one of the trackway bars D, relay R³ will be effectively energized,
 85 so that magnet M will be energized. When the core 24 passes over one of the bars D, if the adjacent conductor W is supplied with current, relay R³ will continue to be energized, but if such conductor W is not
 90 supplied with current, relay R³ will open and so will deenergize magnet M to cause an automatic brake application. When core 24 passes away from bar D, relay R³ will
 95 remain deenergized because circuit *b* includes a contact 57 of this relay which is closed only when the relay is energized. To permit the vehicle to proceed after it has been brought to a stop, a push button
 100 76 is provided which, when closed, closes a shunt around contact 57, and which, as in Fig. 1, is accessible only from the ground. When this button is closed, it closes circuit
 105 *b*, whereupon circuit *c* is supplied with current of the predetermined frequency so that relay R³ becomes effectively energized and will remain so after button 76 is released.

Referring now to Fig. 3, the trackway apparatus shown herein is the same as that
 110 shown in Figs. 1 and 2. As for the apparatus on the vehicle, the oscillating circuit *a* which excites the grid of the electron tube K includes the coil 23 on the core 24, this circuit being from secondary 12 of
 115 transformer T³, through condenser 11, wire 70, coil 23, wire 69 to secondary 12. The plate circuit for the electron tube K is from battery 13, through wires 14 and 71, contact 72 of relay R³, wire 73, primary of
 120 transformer T², wire 74, primary 19 of transformer T³, wire 20, thence through the electron tube K to battery 13. Oscillating circuit *b*, which is energized by virtue of
 125 transformer T², is from the secondary of this transformer, through wire 75, condenser 46, wires 62 and 70, coil 44 and wire 68 to the secondary of transformer T². This circuit *b* constitutes the grid or exciting circuit for electron tube K'. The control of relay R³ by the plate circuit of electron tube K',
 130

and the control of brake application magnet M by relay R³, are the same as in Fig. 2.

The plate circuit of electron tube K will, of course, deliver alternating current of a frequency depending on the constants of circuit *a* and these constants are so chosen that the plate circuit current will be of the "given" frequency when coil 23 is not in proximity to trackway bar D. The current will be of a different frequency when coil 23 is in proximity to a trackway bar D, that is, when the inductance of coil 23 is increased. Circuit *b* is tuned to resonance at the "given" frequency. It follows, then, that when core 24 is not affected by a trackway bar D, oscillations are maintained in circuit *b*, and the alternating current flowing in the plate circuit of electron tube K' is sufficient to energize relay R³. When, however, core 24 passes over one of the trackway devices D, the inductance of the circuit *a* is changed so that the frequency of the current flowing in the plate circuit of electron tube K is likewise changed. Inasmuch as the current which is then delivered to circuit *b* is of a frequency different from that to which this circuit is tuned, the current which will then flow in circuit *b* will be materially reduced and the current delivered by electron tube K' is then insufficient to effectively energize relay R³.

The operation of the apparatus shown in Fig. 3 will be obvious from the explanations given hereinbefore of the operation of the apparatus shown in Figs. 1 and 2. When a trackway bar D is encountered whose adjacent conductor W is deenergized, relay R³ will open so that the brakes will be applied. After the vehicle leaves the bar D, relay R³ will remain open because the plate circuit for electron tube K includes a contact 72 or relay R³ which is closed only when the latter relay is effectively energized, and hence circuit *b* and the plate circuit for electron tube K' are then deprived of current. To permit the vehicle to proceed after being brought to rest, a push button 76 is provided which, when closed, closes a shunt around contact 72, and which, as in Figs. 1 and 2, is so located as to be accessible only from the ground.

Although I have herein shown and described only three forms of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appending claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. Railway traffic controlling apparatus comprising a vehicle, a circuit thereon tuned to resonance at a given frequency, means on the vehicle for supplying alternating current to said circuit, a second circuit com-

prising a fixed inductance and capacity for determining the frequency of said alternating current, vehicle governing means on the vehicle controlled by said first circuit and arranged to be inactive when said first circuit is tuned to said frequency, devices located at intervals in the trackway for temporarily destroying the resonance of said first circuit at said frequency, means on the vehicle for keeping said governing means in inactive condition independently of said first circuit, and other devices located in the trackway adjacent said first-mentioned devices and controlled by traffic conditions in advance for causing said last-mentioned means to be effective.

2. Railway traffic controlling apparatus comprising a vehicle; an electron tube thereon having an incandescent filament, a plate, and a grid interposed between the plate and filament; a plate circuit for said electron tube including a source of current and the primary of a transformer, means for energizing the grid of said electron tube comprising a circuit including a condenser and the secondary of said transformer, whereby current of a given frequency is maintained in the plate circuit, a second circuit tuned to resonance at the given frequency and arranged to be energized inductively from said plate circuit, a relay having a winding included in the second circuit, and effectively energized only when said circuit is resonant at said given frequency, a stick relay whose holding circuit is controlled by said relay, devices located at intervals in the trackway for temporarily changing the inductance of the second circuit sufficiently to cause said relay to become deenergized, a second relay on the vehicle arranged when energized to close the pick-up circuit for said stick relay, other devices located in the trackway adjacent said first-mentioned devices and controlled by traffic conditions in advance for causing said second relay to be energized, and vehicle governing means on the vehicle controlled by said stick relay.

3. Railway traffic controlling apparatus comprising a vehicle, a circuit thereon tuned to resonance at a given frequency, means on the vehicle for supplying alternating current of said given frequency to said circuit, a relay R having a winding included in said circuit which relay is energized only when said circuit is resonant at said given frequency, a stick relay whose holding circuit is controlled by said relay R, devices located at intervals in the trackway for temporarily changing the inductance of said circuit sufficiently to cause relay R to become deenergized, a relay R' on the vehicle arranged when energized to close the pick-up circuit for said stick relay, other devices located in the trackway adjacent said first-mentioned devices and controlled by traffic conditions

in advance for causing relay R' to be energized, and vehicle governing means on the vehicle controlled by said stick relay.

4. Railway traffic controlling apparatus comprising a vehicle; an electron tube thereon having an incandescent filament, a plate, and a grid interposed between the filament and the plate; a plate circuit for said electron tube including a source of current and the primary of a transformer, a grid circuit for said electron tube including a condenser, a circuit *a* including said condenser and the secondary of said transformer and said circuit being tuned to resonance at a given frequency whereby current of said frequency is maintained in the plate circuit, a circuit *b* tuned to resonance at the said given frequency and arranged to be energized inductively from said plate circuit, vehicle governing means on the vehicle controlled by said circuit *b* and arranged to be inactive when said circuit is tuned to resonance at said frequency, devices located at intervals in the trackway for temporarily destroying the resonance of said circuit at said frequency, means on the vehicle for keeping said governing means in inactive condition independently of said circuit, and other devices located in the trackway adjacent said first-mentioned devices and controlled by traffic conditions in advance for causing said last-mentioned means to be effective.

5. Railway traffic controlling apparatus comprising a vehicle, a circuit thereon, means for continuously supplying alternating current to said circuit, a second circuit *b* receiving current inductively from the first circuit and tuned to resonance at the frequency of such current, a relay having an energizing winding supplied with current from the first circuit and a second energizing winding supplied with current from circuit *b*, said relay being effectively energized only when circuit *b* is resonant at said frequency, vehicle governing means on the vehicle controlled by said relay and arranged to be inactive when the relay is effectively energized, devices located at intervals in the trackway for temporarily destroying the resonance of circuit *b* at said frequency, means on the vehicle for keeping said governing means in inactive condition when said relay becomes deenergized, and other devices located in the trackway adjacent said first-mentioned devices and controlled by traffic conditions in advance for causing said last-mentioned means to be effective.

6. Railway traffic controlling apparatus comprising a vehicle, a source of alternating current of fixed frequency thereon, a circuit supplied with energy from said source and comprising inductance and capacity, said circuit being tuned to resonance at the frequency of said source, a relay having two

windings one of which is connected with said source and the other with said circuit, said relay being energized only when said circuit is resonant at the frequency of said source, vehicle governing means controlled by said relay and maintained in inactive condition when said relay is energized, trackway means for temporarily varying the inductance of said circuit, and means for maintaining said vehicle governing means in inactive condition independently of said circuit.

7. Railway traffic controlling apparatus comprising a vehicle, a circuit *b* thereon tuned to resonance at a given frequency, means on the vehicle for supplying alternating current of said given frequency to said circuit, vehicle governing means on the vehicle controlled by said circuit and arranged to be inactive when the circuit is resonant at said frequency, devices located at intervals in the trackway for temporarily destroying the resonance of circuit *b* at said frequency, a circuit *c* on the vehicle, an electron tube having a grid circuit controlled by said circuit *c*, means controlled by the plate circuit of said electron tube for keeping said vehicle governing means in inactive condition independently of circuit *b*, and other devices located in the trackway adjacent said first-mentioned devices and controlled by traffic conditions in advance for supplying current to circuit *c*.

8. Railway traffic controlling apparatus comprising a vehicle, a circuit having fixed characteristics and a source of alternating current whose frequency is controlled thereby, a second circuit connected to said source, normally inactive vehicle governing means controlled by said second circuit; trackway means for varying the inductance of said second circuit to render said vehicle governing means active, and means for maintaining said vehicle governing means inactive independently of said second circuit.

9. Railway traffic controlling apparatus comprising a vehicle, a circuit thereon normally tuned to resonance at a given frequency, vehicle governing means on the vehicle controlled by said circuit and held in inactive condition when said circuit is resonant at said frequency, devices located at intervals in the trackway for temporarily destroying the resonance of said circuit at said given frequency, a second circuit on the vehicle, an electron tube on the vehicle having a grid circuit controlled by said second circuit, means controlled by the plate circuit of said electron tube for maintaining said vehicle governing means in inoperative condition irrespective of the condition of the first circuit, and other devices located in the trackway and independent of said

first-mentioned devices and controlled by traffic conditions in advance for supplying current to said second circuit.

10. Railway traffic governing apparatus comprising a vehicle, governing means thereon normally biased to stop the vehicle, a plurality of resonant circuits on the vehicle, means associating such circuits and said governing means to control the latter, and trackway means for affecting two of said vehicle circuits, one of said trackway means being energized when the track is clear in advance, and the other being unaffected by traffic conditions.

11. Railway traffic controlling apparatus comprising a vehicle, governing means thereon biased to give a stop indication, two circuits on the vehicle either of which when energized will cause said governing means to give a proceed indication, the first of said circuits being normally energized by a source of current on the vehicle, trackway means for effectively nullifying the effect of said source in said first circuit, other trackway means for causing the second circuit to be energized, and amplifying means on the vehicle for increasing the effect of said second trackway means on said second circuit.

12. Railway traffic controlling apparatus comprising a vehicle, a circuit thereon containing inductance and capacity, means on the vehicle for supplying alternating current to said circuit, a second circuit on the vehicle including inductance and capacity for determining the frequency of the current supplied to said first circuit, devices located at intervals in the trackway for temporarily changing the value of the inductance in said first circuit and thereby decreasing the current therein, governing means on the vehicle set into operation by such decrease of current in the first circuit, and means governed by traffic conditions for preventing operation of said governing means.

13. Railway traffic controlling apparatus comprising a vehicle, a source of alternating current on said vehicle, a circuit on said vehicle supplied with current from said source and containing inductance and capacity, a normally energized relay on the vehicle having two windings one of which is supplied with current from said circuit and the other from said source independently of said circuit, devices located at intervals in the trackway for temporarily changing the value of the inductance in said circuit sufficiently to open said relay, a second relay on the vehicle, means controlled from the trackway for energizing said second relay, and

governing means on the vehicle held in inactive condition when either of said relays is energized.

14. Railway traffic controlling apparatus comprising a vehicle, a source of alternating current on said vehicle, a circuit on said vehicle supplied with current from said source and containing inductance and capacity, a normally energized relay on the vehicle having two windings one of which is supplied with current from said circuit and the other from said source independently of said circuit, devices located at intervals in the trackway for temporarily changing the value of the inductance in said circuit sufficiently to open said relay, governing means on the vehicle set into operation when said relay opens, and auxiliary means controlled from the trackway for preventing operation of said governing means when said relay opens.

15. Railway traffic controlling apparatus comprising a vehicle, a source of alternating current on said vehicle, a circuit on said vehicle supplied with current from said source and containing inductance and capacity, a normally energized relay on the vehicle having two windings one of which is supplied with current from said circuit and the other from said source independently of said circuit, devices located at intervals in the trackway for temporarily changing the value of the inductance in said circuit sufficiently to open said relay, a stick relay on the vehicle having a holding circuit controlled by said first relay, means controlled from the trackway for picking up said stick relay, and governing means on the vehicle held in inactive condition when said stick relay is closed.

16. Railway traffic controlling apparatus comprising a vehicle, governing apparatus thereon biased to give a stop indication, two circuits on the vehicle either of which when energized will cause said apparatus to give a proceed indication, an electron tube oscillator on the vehicle for normally supplying alternating current of constant frequency to one of said circuits, devices located at intervals in the trackway for effectively nullifying the effect of said one circuit on the governing apparatus, and other devices located in the trackway for causing the other circuit to be energized.

In testimony whereof I affix my signature in presence of two witnesses.

LLOYD V. LEWIS.

Witnesses:

A. HERMAN WEGNER,
E. R. CLUM.