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RAILWAY AND TRAFFIC SIGNAL CONTROL

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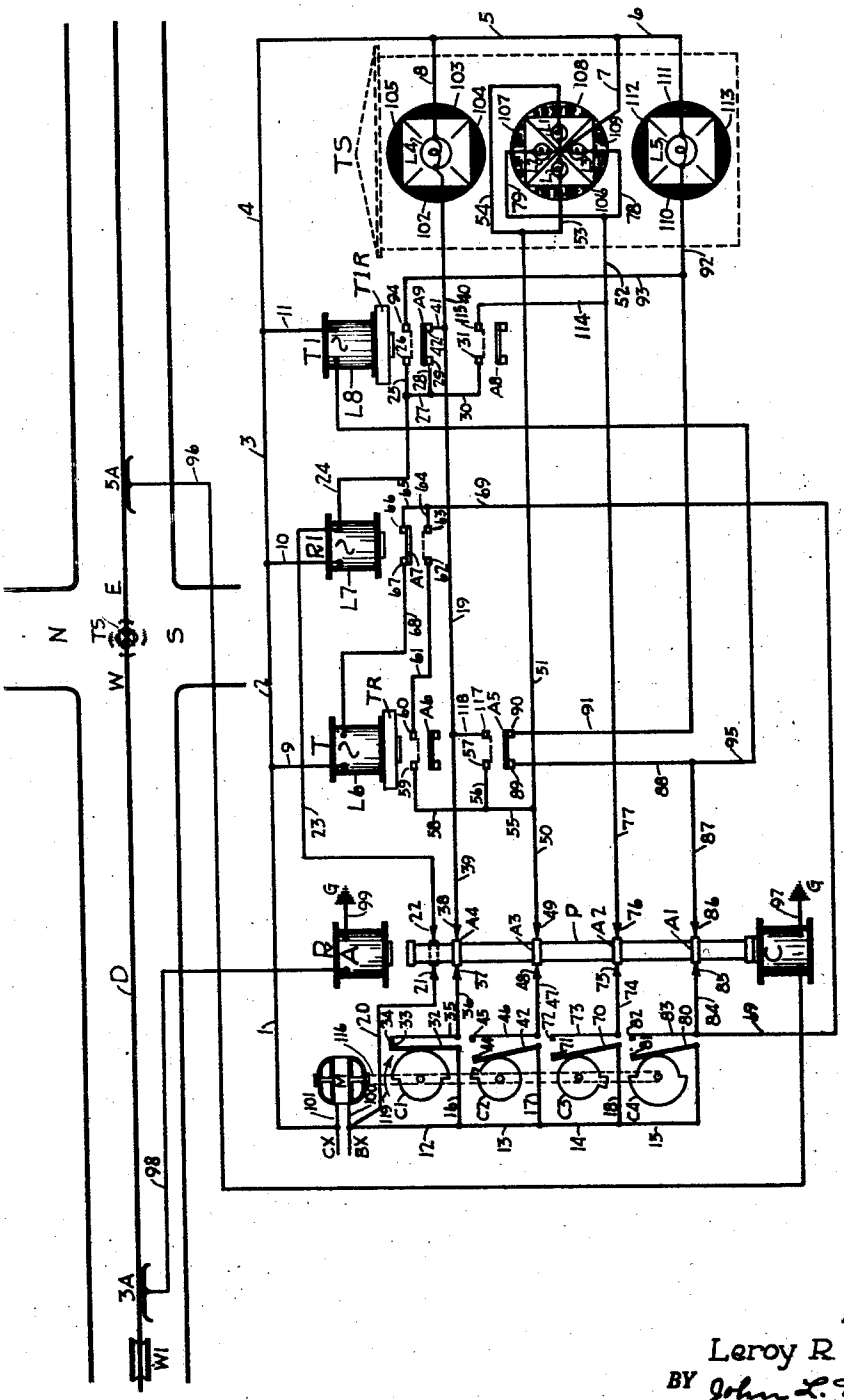


Fig. 1.

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RAILWAY AND TRAFFIC SIGNAL CONTROL

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My invention relates to the vehicular control of an automatic traffic signal, primarily intended for use at the intersection of two thoroughfares, on one of which is operated an electric street railway.

The main object of my invention is to provide a system wherein the indications of a signal controlling intersecting traffic are normally displayed periodically, but with the approach of an electric street car within a selected zone, will cause the traffic signal to display and prolong, a green proceed indication to favor the preferential movement of the car until it passes the intersection, wherein the said traffic signal indications will be restored to the periodical control.

The purpose of such an arrangement is to permit a car to have a continuous movement past points where signals controlling traffic are located, thereby eliminating the objection of having cars make long objectional stops at these intersections, and eliminate the traffic congestion that usually results from the slow movement of street cars.

My invention resides in a new and novel combination, the construction and relation of various electrically operated switches, circuits and other parts hereinafter more fully described and disclosed in the drawing.

In the drawing accompanying my specification:

The figure is a schematic drawing showing the electrical circuits of my system, and the location of the various control apparatus.

My invention is intended primarily to be controlled by cars that are operated with an overhead trolley wheel or current collector W1 mounted on a car by means of a trolley pole, although it may be operated by cars in which current is supplied thereto by other methods.

In the system shown in the figure, the letter D represents a trolley wire. Positioned adjacent the trolley wire D, are trolley contactors 3A and 5A which are normally insulated therefrom, but are electrically connected thereto when the current collector W1 engages the trolley contactors 3A and 5A respectively. The trolley contactor 3A is mounted on the trolley wire D and is placed within a selected proximity on the west approach side of the intersection, represented in the drawing by N, E, S, W. Contactor 5A is mounted on the trolley wire D, on the far side of the said intersection.

At the intersection the letters TS represent a traffic signal periodically displaying stop, caution and proceed indications for the W, E electric line traffic, and the N, S intersecting traffic.

I also employ an electrically operated relay R provided with two operating coils A and C, and each are energized to produce subsequent operations of the contact plunger P. When a car passes the trolley contactor 3A the coil A is energized and the contact plunger P is attracted thereto, and when the car passes the trolley contactor 5A the coil C is energized, and the plunger P is attracted thereto returning it to its normal position. The plunger P of relay R is equipped with contact rings A1, A2, A3, and A4. The contact ring A1 normally engages 85 and 86, the contact ring A2 normally engages contacts 75 and 76, the contact ring A3 normally engages contacts 48 and 49, the contact ring A4 normally engages contacts 37 and 38, and each are brought into this position through the movement of the contact plunger P and the energization of the coil C. When the coil A is energized, the contact plunger P is shifted, and all the latter mentioned contact rings disengage their normal engaged contacts, and only the contact ring A4 of relay R is brought into contact engagement with any other contacts through this operation. The shifting of the plunger P through the energization of the coil A brought the contact ring A4 into contact engagement with the contacts 21 and 22 and out of contact engagement with the contacts 37 and 38. It is very evident to those skilled in the art that the relay R may be provided with a counting device, that is, the initial energization of the operating coil A will cause a shifting of the contact plunger P as described, but subsequent energizations of the coil A will be so registered, that a corresponding total number of energizations of the coil C will be required before the contact plunger

P can be restored to its normal position. In the drawing a simplied conventional form is employed to show the relay R, but it is very evident to those skilled in the art that this change requires no change in the electrical operation of my system.

The relays T, T1 and R1 that I employ are used to produce the desired reversals in the traffic signal indications when a car operates the relay R to take control of the traffic signal indications, and when the relay R is restored to normal, to return the display of the signal indications to the periodical control.

The relay T that I employ is equipped with a retarded release time element factor TR, and this may be produced by many well known constructive principles of the art, primarily through the use of a dash-pot arrangement or similar construction. The relay T is also equipped with an operating coil L6 and contact bridging bars A5 and A6. When the coil L6 of relay T is deenergized, the contact bridging bars A5 and A6 rest against their back contacts. The contact bridging bar A5 makes contact engagement with its respective back contacts 89 and 90. In this position the contact bridging bar A6 does not make contact engagement with any contacts, and rests against contacts for stops as shown in the drawing. When the coil L6 of relay T is energized the contact bridging bars A5 and A6 disengage their respective back contacts and come into contact engagement with their respective front contacts. The contact bridging bar A5 disengaging the contacts 89 and 90 and coming into contact engagement with its respective front contacts 57 and 117. The contact bridging bar A6 disengaging the contacts that were used as back-stops and coming into contact engagement with its respective front contacts 59 and 60.

The relay T1 that I employ is equipped with a retarded release time element factor TIR of the same character employed for relay T. The relay T1 is equipped with an operating coil L8 and a contact bridging bar A8 and A9. When the operating coil L8 of relay T1 is deenergized the contact bridging bars A8 and A9 rest against their respective back contacts. The contact bridging bar A8 rests against its back contacts but no electrical circuit is completed, and the contacts are merely used as a back-stop. The contact bridging bar A9 rests against its back contacts 29 and 42 and makes contact engagement therewith. When the coil L8 of relay T1 is energized the contact bridging bars disengage their respective back contacts and come into contact engagement with their respective front contacts. The contact bridging bar A8 coming into contact engagement with its respective front contacts 31 and 115, and the contact bridging bar A9 coming into contact engagement with its respective front contacts 26 and 94.

The relay R1, that I employ, is not provided with any retarding time element factors, that is, the contact bridging bar A7 makes instantaneous movements when the operating coil L7 of relay R1 is energized or deenergized respectively. When the coil L7 of relay R1 is energized the contact bridging bar A7 makes contact engagement with its respective front contacts 66 and 67, and when the coil L7 is deenergized the contact bridging bar disengages these contacts and comes into contact engagement with its respective back contacts 62 and 63.

I also employ in this system, a motor driven time element device controlling circuits for the periodical display of the stop, caution and proceed signals. The letter M represents a motor that drives the controller segments C1, C2, C3 and C4, through the shaft 116. With reference to the drawing, it can be clearly seen how the rotation of the cam segments in the direction of the arrow 119 produce subsequent opening and closing of the various contacts controlling the circuits of the signal indications and do not believe that a further explanation of how this is accomplished is necessary.

The outline figure TS is a symbolic representation of a traffic signal. housing three decks of signal indications. Each deck is equipped with separate indications to be displayed in the four directions. In the upper deck, the red lenses 104 and 105 that face N and S on the intersection, and the green lenses 102 and 103 that face W and E on the electric line, have a common light source represented by L4. In the center deck the four lenses 106, 107, 108, and 109 display an amber or caution indication, and each is provided with an independent light source, lens 106 having a light source represented by L, lens 107 having a light source represented by L2, lens 108 having a light source represented by L1 and the lens 109 having a light source represented by L3. These indications, however, are not displayed simultaneously, but are displayed at intervals that will be described in a later description. In the lower deck the green lenses 112 and 113 that face N and S on the intersection, and the red lenses 110 and 111 that face W and E on the electric line, have a common light source represented by L5. For clarity of the description each of the three decks are shown in a plan view, and this must be taken into consideration when the signal system is described so that the proper signal indications will be given for their proper directions.

The indications of the traffic signal are normally displayed periodically; that is, each signal indication displays a certain predetermined time before the display of another signal indication occurs, all of which oc-

curs in a definite sequence of a predetermined cycle. Starting for instance at an arbitrarily selected time of the cycle, we have a displayal of a green signal in both directions for the W and E electric line traffic, and a displayal of a red signal in both directions for the N and S intersecting traffic. The circuit for these indications is under the control of the cam C1 of the motor driven time element device. With reference to the drawing, it can be seen that these indications will continue to display until the cam segment C1 permits the contact arm 32 to disengage the contacts 33 and 34, which is, as shown, one half of the total cycle. It will also be noted, that just as the cam segment C1 nears the end of its period, the cam C2 embraces the contact arm 42 of the motor driven time element device and the contacts 44 and 45 are brought into contact engagement, resulting in a displayal of an amber caution signal to warn the moving electric line traffic that a change is about to be made in the electric line indications. It will be well to note that this indication is not given to all four sets of the traffic at the same time, but to the traffic that is in motion only, and is given with the green proceed electric line signal indicating. Cams C1 and C2 disengage their respective contact arms simultaneously, and instant to this operation the cam C4 embraces the contact arm 80 of the motor driven time element device and the contacts 81 and 82 are brought into contact engagement. These operations resulted in the former described indications going to darkness, and the displayal of a red indication for the W, E electric line traffic and a green indication for the N, S intersecting traffic. It will be noted that the displayal of these indications resulted in the moving traffic coming to a stop, and the traffic that was at stop to be permitted to proceed. With reference to the drawing, it will be noted that these indications will continue to display until the cam segment C4 permits the contact arm 80 to disengage the contacts 81 and 82, which is, as shown, one half of the total cycle. It will also be noted, that just as the cam segment C4 nears the end of its period, the cam C3 embraced the contact arm 70 of the motor driven time element, and the contacts 71 and 72 were brought into contact engagement, resulting in a displayal of an amber caution signal to warn the moving intersecting traffic that a change was about to be made in the signal indications. This caution indication was not given to the four sets of traffic at the same interval, but was given to the traffic that was in motion only, and was given with the green proceed signal indicating. The cams C3 and C4 disengage their respective contact arms simultaneously and instant to this operation the cam C1 embraces the contact arm 32 and the signal indications are continuously displayed through the same cycle as described.

When the current collector W1 engages the trolley contactor 3A, the contactor will be electrically connected and of the same potential as the trolley wire, and the coil A of relay R will be energized and shift the plunger P of relay R, bringing the contact ring A4 into contact engagement with contacts 21 and 22, and removing the contact rings A1, A2, A3 and A4 out of contact engagement with their normal engaged contacts, as was heretofore described. The circuit for the energization of coil A of relay R being completed from the trolley wire D, through the current collector W1, through the contact strip of the trolley contactor 3A, wire 98, coil A of relay R, wire 99 to the ground G. As soon as the current collector disengaged the trolley contactor, the coil A of relay R was deenergized but the plunger P of relay R remained in the shifted position. If at the time the plunger P of relay R operated, the traffic signal was displaying a green W, E electric line indication and a red N, S intersecting traffic indication, no change would occur in the display of the indications, but the operation of relay R would remove the periodic control of the automatic motor driven time element device, and would establish a circuit to prolong the display of these indications until the current collector W1 came into contact engagement with the trolley contactor 5A. The circuit for prolonging the display of the green W, E electric line indications, and the red N, S intersecting traffic indications, being completed from the positive side of the line BX through wire 20, contact 21 of relay R, through the contact ring A4 on the plunger P of relay R, through the contact 22 of relay R, wire 23, wire 24, wire 27, wire 28, back contact 29 of relay T1, through the contact bridging bar A9 of relay T1, through the back contact 42 of relay T1, wire 41, wire 40, lamp L4 which is a common light source for the later mentioned indications, wire 8, wire 4, wire 3, wire 2, wire 1, to the common return of the line CX. If, however, the signal was displaying a red indication for the W, E electric line traffic, and a green indication for the intersecting N, S traffic a change would occur in the display of the signal indications, that is, an amber indication would be displayed for a predetermined time and then the signal indications would reverse, wherein a green indication for the W, E electric line traffic and a red indication for the N, S intersecting traffic would be displayed. At the time the red W, E electric line traffic indication and the green N, S intersecting traffic indication was initially displayed, the operating coil L8 of the retarded release time element relay T1 was energized. The circuit for the energization of the coil L8 of relay T1

being completed from the positive side of the line BX, through wire 12, wire 13, wire 14, wire 15, contact arm 80 of the motor driven time element device, contact 81 of contact arm 80, contact 82 of the stationary contact arm 83, through the stationary contact arm 83, wire 84, contact 85 of relay R, through the contact ring A1 on the plunger P or relay R, contact 86 of relay R, wire 87, wire 95, operating coil L8 of relay T1, wire 11, wire 3, wire 2, wire 1, to the common return of the line CX. When the relay R operated, and shifted its contact plunger, the contact ring A1 on the plunger P of relay R disengaged contacts 85 and 86 of relay R opening the circuit of the operating coil L8 of relay T1 that was completed through them; however, the red W, E electric line indication and the green N, S intersecting traffic indication, was not immediately removed, as a second circuit was established through the operation of relay R, to retain these indications until the amber caution indication had been displayed for a predetermined time. The circuit that retained the display of the red W, E electric line indication and the green N, S intersecting traffic indication, and displayed the amber caution indication for the N, S intersecting traffic, being completed from the positive side of the line BX, through wire 20, contact 21 of relay R, through the contact ring A4 on the plunger P or relay R, contact 22 of relay R, wire 23, wire 24, wire 25, front contact 26 of the retarded release time element relay T1, through the contact bridging bar A9 of relay T1, through the front contact 94 of relay T1, wire 93, wire 92, lamp L5 which is the light source for the red W, E electric line traffic indication and the green N, S intersecting traffic indication, wire 6, wire 5, wire 4, wire 3, wire 2, wire 1 to the common return of the line CX. It will be noted that wire 24 fed two branch circuits, one circuit through wire 25 to display the latter described indications, and another to wire 27 to establish the circuit for the display of the N, S intersecting traffic caution indications. The latter mentioned circuit being completed from the wire 24 through wire 27, wire 30, front contact 31 of relay T1, through the contact bridging bar A8 of relay T1, through the front contact 115, of relay T1, wire 114, wire 52, wire 78, to lamp L3, also wire 79 to the lamp L2, through the common connecting wire 7, wire 5, wire 4, wire 3, wire 2, wire 1 to the common return of the line CX. The circuit of the operating coil L8 of the retarded time element relay T1 was opened through the operation of relay R, resulting in the contact bridging bars A8 and A9 disengaging their respective front contacts after the time interval of relay T1 had functioned. The disengagement of these contacts resulted in the latter described indications going to darkness, but instant to this operation the contact bridging bar A9 came into contact engagement with its respective back contacts, and a green W, E electric line indication and a red N, S intersecting traffic indication was displayed. The circuit for the latter indications being completed from the positive side of the line BX through wire 20, contact 21 of relay R, through the contact ring A4 on the plunger P of relay R, through the contact 22 of relay R, wire 23, wire 24, wire 27, wire 28, back contact 29 of relay T1, contact bridging bar A9 of relay T, back contact 42 of relay T1, wire 41, wire 40, lamp L4 which is the light source for the four later mentioned indications, wire 8, wire 4, wire 3, wire 2, wire 1 to the common return of the line CX. As was heretofore described, the green W, E electric line indication and the red N, S intersecting traffic indication, would now be prolonged under the control of the car until the current collector W1 engaged the trolley contactor 5A.

After the car completed its course of travel and passed the intersecton N, E, S, W its current collector W1 came into contact engagement with the trolley contactor 5A. The contact engagement of the current collector W1, and the trolley contactor 5A, resulted in the coil C of relay R being energized and the contact plunger P restored to its normal position. The circuit for the energization of the coil C of relay R being completed from the trolley wire D, through the current collector W1, through the contact strip of the trolley contactor 5A, wire 96, coil C of relay R, wire 97, to the ground G. The restoring of the contact plunger P of relay R to its normal position, resulted in the contact ring A4 disengaging the contacts 21 and 22 and coming into contact engagement with contacts 37 and 38, and the contact rings A1, A2, and A3 on the plunger P of relay R being restored into contact engagement with their respective contacts, as heretofore described. If the automatic motor driven time element device had entered the period for the display of a green W, E electric line traffic indication and a red N, S intersecting traffic indication, wherein the cam C1 of the motor driven time element device embraced the contact arm 32 and brought the contacts 33 and 34 into contact engagement, no immediate change would occur in the display of the signal indications, but the relay system would be restored to normal and the display of the traffic signal indications would be restored to the influence of the periodical control, of the automatic motor driven time element device. If however, the automatic motor driven time element device had entered the period for the display of a red W, E electric line indicaton and a green N, S intersecting traffic indication, wherein the cam C4 of the motor driven time element device embraced the contact arm 80 and brought the contacts 81

and 82 into contact engagement, a change would occur in the display of the signal indications, that is, an amber caution indication would be displayed for the moving W, E electric line traffic, for a predetermined time, and then the signal indications would be reversed, resulting in a red indication being displayed for the W, E electric line traffic, and a green indication for the N, S intersecting traffic. The relays and circuits that produced the latter mentioned sequence of indications being under the control of the neutral relay R1, and the retarded release time element relay T. It will be noted, however, that as long as the contact plunger P of relay R remained shifted through the energization of its operating coil A, the contact ring A4 on the plunger P was in contact engagement with the contacts 21 and 22, and a circuit was established for the energization of the operating coil L7 of relay R1, wherein the contact bridging bar A7 was brought out of contact engagement with its respective back contacts 62 and 63, and was taken into contact engagement with its respective front contacts 66 and 67. The circuit for the energization of the operating coil L7 of relay R1 being completed from the positive side of the line BX, through wire 20, contact 21 of relay R, through the contact ring A4 on the plunger P of relay R, contact 22 of relay R, wire 23, operating coil L7 of relay R1, wire 10, wire 2, wire 1 to the common return of the line CX. As soon as the contacts 81 and 82 of the motor driven time element device were closed, as heretofore mentioned, a circuit was completed for the energization of the coil L6 of relay T, wherein the contact bridging bars A5 and A6 of relay T disengaged their respective back contacts and came into contact engagement with their respective front contacts. The circuit for the energization of the operating coil L6 of relay T being completed from the positive side of the line BX, through wire 12, wire 13, wire 14, wire 15, contact arm 80 of the motor driven time element device, contact 81 of the contact arm 80, contact 82 of the stationary contact arm 83, through the stationary contact arm 83, wire 69, wire 65, front contact 66 of relay R1, through the contact bridging bar A7 of relay R1, front contact 67 of relay R1, wire 68, operating coil L6 of the retarded release time element relay T, wire 9, wire 1, to the common return of the line CX. The disengagement of the contact bridging bar A5 of relay T with its back contacts, opened the circuit for the red W, E electric line indication, and the green N, S intersecting traffic indication that was completed through them, but as this circuit was already opened through the initial operation of the relay R, wherein the contact ring A1 on the plunger P disengaged the contacts 85 and 86, no immediate change occurred in the display of the signal indications, however, as soon as the contact plunger P of relay R was restored to normal, as heretofore mentioned, the circuit for the operating coil L7 or relay R1 was opened, and the contact bridging bar A7 of relay R1 was released, disengaging its front contacts 66 and 67 and coming into contact engagement with its respective back contacts 62 and 63. The disengagement of the contact bridging bar A7 of relay R1 with its respective front contacts, opened the circuit of the operating coil L6 of relay T, but the contact bridging bars A5 and A6 of relay T, were not immediately released, as the relay T is provided with a retarded release time element factor. As soon as the contact bridging bar A7 of relay R1 came into contact engagement with its back contacts 62 and 63, a circuit was completed to continue the display of the green W, E electric line indication, and a red N, S intersecting traffic indication, also to cause a display of an amber indication to warn the moving W, E electric line indication that a change is about to be made in the display of the signal indications. The circuit for the continuation of the green W, E electric line indication, and the red N, S intersecting traffic indication, being completed from the positive side of the line BX, through wire 12, wire 13, wire 14, wire 15, contact arm 80 of the motor driven time element device, contact 81 of the contact arm 80, contact 82 of the stationary contact arm 83, through the stationary contact arm 83, wire 69, wire 64, back contact 63 of relay R1, contact bridging bar A7 of relay R1, back contact 62 of relay R1, wire 61, front contact 60 of relay T, through the contact bridging bar A6 of relay T, front contact 59 of relay T, wire 58, wire 56, front contact 57 of relay T, through the contact bridging bar A5 of relay T, front contact 117 of relay T, wire 118, wire 19, wire 40, lamp L4, which is the light source for the four indications, wire 8, wire 4, wire 3, wire 2, wire 1 to the common return of the line CX. It will be noted that the wire 58 fed two branch circuits, one through wire 56 for continuing the display of the green W, E electric line indication, and the red N, S intersecting traffic indication, and the other to wire 55, which is the circuit for the display of the electric line caution indication. This circuit being completed from wire 58 to wire 55, through the wire 55, wire 51, wire 53 to the lamp L, also wire 54 to the lamp L1, which are the light sources for the electric line caution indications, through the common connecting wire 7, wire 5, wire 4, wire 3, wire 2, wire 1 to the common return of the line CX. After the predetermined time interval of the relay T the contact bridging bars A5 and A6 of relay T disengaged their respective front contacts and came into contact engagement with their respective back contacts and opened the

circuits that completed the latter mentioned indications. The contact engagement of the contact bridging bar A5 of relay T with its back contact 89 and 90 permitted the circuit for the display of the red W, E electric line indication, and the green N, S intersecting traffic indication, to be completed through them, and under the influence of the circuit established at the contacts 81 and 82 of the motor driven time element device. This operation resulted in the relay system being restored to normal and the display of the traffic signal indications being restored to the influence of the periodical control of the automatic motor driven time element device.

There are, of course, modifications and arrangements of parts and circuits which may be made from those shown in the above disclosure and which will still fall within the scope of my invention.

I claim:—

1. In a street intersection traffic control signal system, in which a preferred street having an electrical vehicle thereon operating from a current supply feeder may take the right of way indication to the exclusion of the other street, including a plurality of signal lamps; signal timer means for normally cyclically displaying said signals to alternately give the right of way indication to the several streets; a vehicle current collector responsive device on the preferred street; super-control means connected to be operated by the current collector responsive device when actuated by a vehicle on the preferred street to render said signal timer means ineffective to normally display said signals and to give a right of way indication to the preferred street and time delay signal control means interposed in the signal control circuits of said super-control means to delay the display of said right of way indication to the preferred street and to display a caution signal to the other street during said delay when the right of way indication is transferred from the other street to said preferred street by means of said super-control means.

2. In a street intersection traffic control signal system, in which a preferred street having an electrical vehicle thereon operating from a current supply feeder may take the right of way indication to the exclusion of the other street, including a plurality of signal lamps; signal timer means for normally cyclically displaying said signals to alternately give the right of way indication to the several streets; a vehicle current collector responsive device on the preferred street; super-control means connected to be operated by the current collector responsive device when actuated by a vehicle on the preferred street to render said signal timer means ineffective to normally display said signals and to give a right of way indication to the preferred street and time delay signal control means interposed in the signal control circuits of said super-control means to delay the return of the right of way indication to said other street and to display a caution signal to said preferred street during said delay, after the signal control has been relinquished by said super-control and has reverted to said signal timer means.

In testimony whereof I affix my signature.

LE ROY R. WAGNER.