

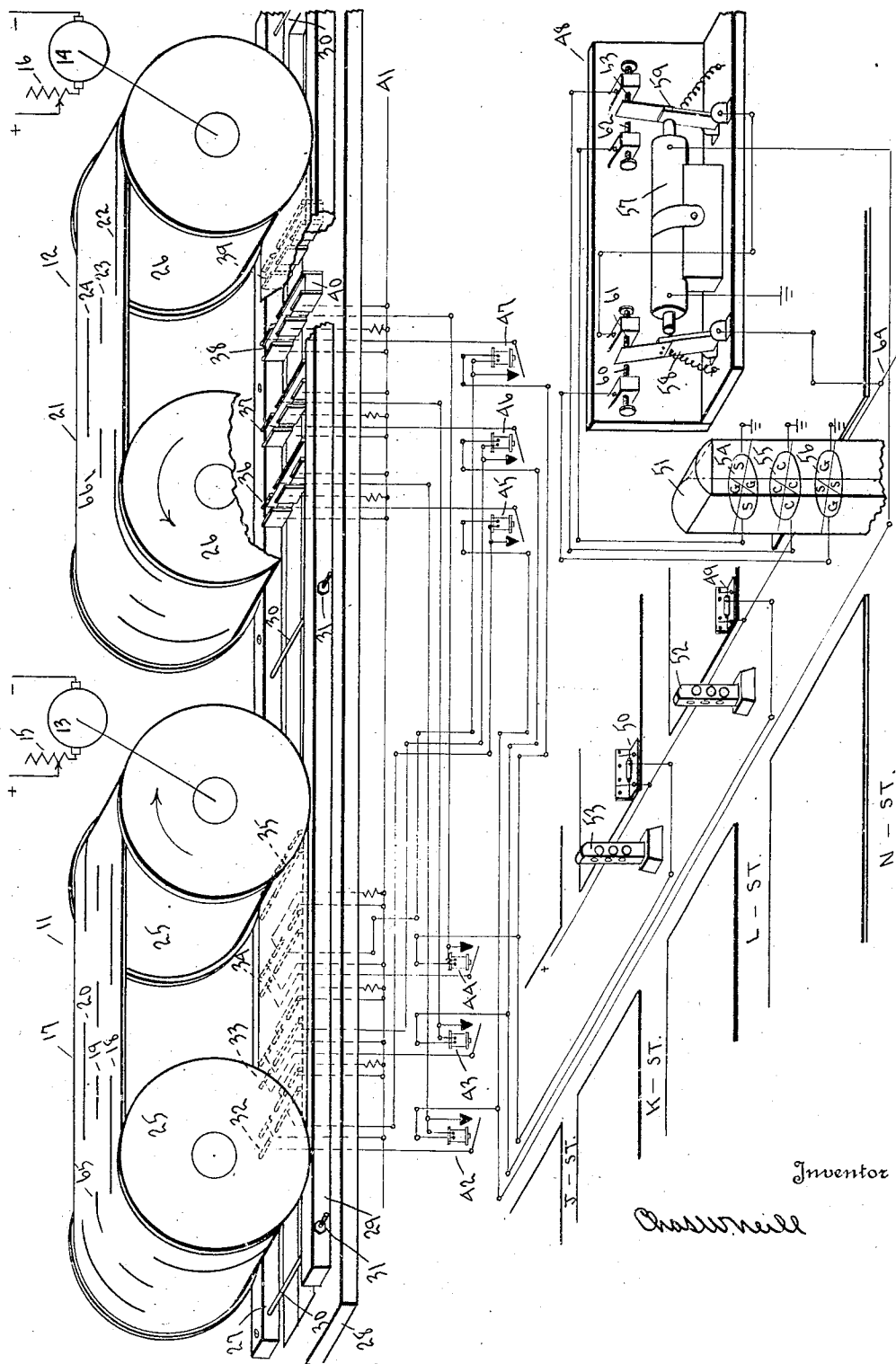
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TRAFFIC SIGNAL CONTROL MECHANISM

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Inventor

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UNITED STATES PATENT OFFICE.

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TRAFFIC-SIGNAL-CONTROL MECHANISM.

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My invention relates to improvements in mechanism for operating signal lights for directing street traffic.

The development in street traffic control is toward non-stop systems. In systems providing for non-stop traffic it is necessary to use means for operating the signal lights so that the Go signal will in effect progress down the street ahead of the traffic. Such a system is claimed in application No. 45,334 and mechanism for operating signals according to such a system is claimed in application No. 167,711.

The object of this invention is to provide means whereby traffic signals may be operated from a central station according to the most approved non-stop systems. Another object of my invention is to provide means whereby all of the lights in each signal tower, i. e. the Stop, Caution, and Go lights, may be operated from the central station thru a single wire from the central station to each signal tower.

Further objects of my invention are to provide means for operating traffic signal lights according to a non-stop system, which means shall be adjustable for the unequal distances between street intersections, the difference in traffic volumes in different directions at various times of day and which shall be capable of adjustment to obtain slower speed for traffic at such times as desirable.

Other objects and advantages will appear as the description proceeds.

One embodiment of my invention is shown in the accompanying drawing which shows an avenue having four intersecting streets, three of which are equipped with signal towers for directing the traffic. The switch mechanism at each tower and the mechanism at the central control station are shown, together with the wiring of the system.

The operation of the central control mechanism is as follows—Two commutator mechanisms 11 and 12 are rotated in opposite directions by motors 13 and 14. The speed of the motors 13 and 14 may be governed by the speed controls 15 and 16.

The commutator mechanism 11 consists of a belt 17 running on spools 25. The belt 17 is a nonconductor, but has conductor contact strips or brushes mounted on the outside of

it. Contact strips 18, 19, 20, and 65 comprise one set. Similar sets are equally spaced along the length of the belt as shown.

The commutator mechanism 12 is made up of a nonconductor belt similar to belt 17, running on spools 26. Contact strips 22, 23, 24, and 66 comprise one of the sets of contact strips which are evenly spaced along the length of belt 21.

A guide bar 27 is rigidly mounted on a base plate 28. A guide bar 29 rests on the base plate 28 and is free to slide on said base plate. Clamping members 30 connect the guide bars 27 and 29. Nuts 31 may be screwed up to draw the guide bars 27 and 29 closer together.

Contact units 32, 33, 34, 35, 36, 37, 38, and 39 rest on the base plate 28 and are held in position as shown by the clamping action of guide bars 27 and 29 thus forming a commutator. The contact units are set at the desired spacing from one another before the guide bars 27 and 29 are drawn against them by screwing up nuts 31.

The guide bars 27 and 29 are of some non-conducting material. The contact units are all similar and their construction will be understood by referring to contact unit 38. This contact unit consists of an insulating block 40 having contacts mounted on two sides of it, each of said contacts extending slightly above the top of the block 40 as shown. The contacts are the same size and equally spaced except for one long contact on one side which extends the length of two of the short contacts on the opposite side. This construction is clearly shown in the drawing.

Contact units 32, 33, 34, and 35 when held in position form a commutator under commutator mechanism 11 and will touch the belt 17. Contact strips 18, 19, 20, and 65 as they pass over contact units 32, 33, 34, and 35 will close the circuit between the contacts which are mounted on opposite sides of the contact unit for purposes which will appear as the description proceeds. Contact strips 22, 23, 24, and 66 will operate in a similar manner on contact units 36, 37, 38, and 39.

The invention is not in any way limited to the number of contact units shown. The belts may be of any lengths and any number of contacts placed under them. Neither

is it necessary that the contact units be arranged in a straight line. The invention is illustrated as shown in the drawing to simplify the mechanism and better explain the principle. It will at once be apparent, however, to those skilled in the art that arrangements such as radially set contact units set under solid disks instead of belts would have practical advantages. Such mechanical details, however, would not be a change in the application of the principle but merely a substitution of mechanical parts.

All of the contacts on contact units 32, 33, 34, 36, 37, and 38 have wires from them running thru a slot in the base plate 28. Contact units 35 and 39 have no wires running from them. These contact units are not in use in the system shown in the drawing but are to be wired in the event that the system be extended to include another street intersection.

All of the contacts on the three contact side of the contact units 32, 33, 34, 36, 37, and 38 are wired to a power line 41. The middle one of each of these three contacts has a resistance placed in the circuit as illustrated. These resistances make the voltage on the middle contact less than that on the side contacts.

Both of the contacts on the two contact side of the contact units are wired to magnetic switches as illustrated. These switches are given reference characters 42, 43, 44, 45, 46, and 47 in the drawing. It will be noted that switches 42 and 45 both connect with a wire which runs down the avenue to switch unit 48. Magnetic switches 43 and 46 both connect to a wire which runs down the avenue to switch unit 49. Magnetic switches 44 and 47 both connect to a wire which runs down the avenue to switch unit 50.

The operation of the commutator mechanism 11 is as follows: The belt is driven in the direction indicated by the arrow. When the first strip 20 of a set of contact strips gets into position over contact unit 34 the circuit between the two furthest contacts will be closed. The circuit will then be complete from the power line 41 to the armature of magnetic switch 44 and if this switch is closed the circuit will run through the magnet coil of the switch and then down the avenue to switch unit 50 which operates signal tower 53. The reason for making this circuit through the magnetic switch will appear hereafter. If the magnetic switch is open, as shown in the drawing then closing the circuit as far as the armature will have no effect. But if the Go light, for non-stop avenue traffic, in signal tower 53 is lit by commutator mechanism 12, then magnetic switch 44 will be closed and when contact strip 20 closes the circuit as described, magnetic switch 44 will be kept closed until all of the contact strips in the set with contact

strip 20 have passed across contact unit 34.

The reason for keeping this switch closed in this way is to prevent the avenue traffic Go signal from changing to Stop just a few seconds before the other commutator mechanism changes it to Go again. Such short periods would be of no value to the cross traffic, which might not even have time to start, and would needlessly signal avenue traffic to stop when perhaps one-half second later the signal to go would again be given. If ten seconds seems to be the shortest period which it is worth while to open for cross traffic then contact strips 20 should close the circuit between the two furthest contacts of contact unit 34 ten seconds before the contact strip 19 closes the circuit between the middle contact and the long contact.

When contact strip 19 closes the circuit between the middle contact and the long contact of contact unit 34 the circuit will be complete from power line 41 through the resistance, through the said contacts of contact unit 34 and through the magnet of magnetic switch 47 and down the avenue to switch unit 50.

When contact strip 18 closes the circuit between the nearest contact and the long contact of contact unit 34 the circuit is the same as for contact strip 19 except that the resistance between the power line 41 and contact unit 34 is cut out. Contact strip 65 has the same effect as had contact strip 19. Thus as the set of contact strips pass over contact unit 34, contact strip 20 will cause a voltage to be transmitted to switch unit 50 if the avenue Go light is lit in signal tower 53. Contact strip 19 will cause a reduced voltage, the value of which will depend on the amount of resistance in the circuit, to be transmitted to switch unit 50. Contact strip 18 will cause the full line voltage to be transmitted to switch unit 50 and the current flow with this voltage will cause magnetic switch 47 to close. Contact strip 65 will cause the reduced voltage to again be impressed on switch unit 50.

The contact strips on both commutator mechanisms operate on the contact units which they pass over in a manner similar to the operation described in connection with contact unit 34; one contact unit of each commutator mechanism affecting one of the switch units along the avenue.

Each of the signal towers along the avenue is operated by a switch unit. Switch unit 48 which operates signal tower 51 is shown in detail in the drawing. The signal towers shown each have three lights. Referring to signal tower 51; the upper light indicates Go to traffic on the avenue and Stop to cross traffic. The middle light indicates Caution to all traffic. The lower light indicates Stop to avenue traffic and Go to cross traffic. These lights in sig-

nal tower 51 are operated by switch unit 48.

The switch unit 48 consists of a magnet 57, armatures 58 and 59 and adjustable contacts 60, 61, 62, and 63. The magnet 57 is excited whenever a voltage is impressed on the wire connecting switch unit 48 with the commutator mechanisms 11 and 12 at the central control station. When the low or reduced voltage is impressed on magnet 57 the magnet is excited sufficiently to draw up the armature 58 against the tension of a spring which normally holds this armature away from the magnet. When the full line voltage is impressed on magnet 57 it is excited so that it draws up both armatures against their springs which hold them normally away from the magnet.

Armature 58 is wired to a power line 64 which runs the length of the avenue and provides power to light the signal lights. Armature 59 is wired to adjustable contact 61.

When the magnet 57 is not excited the armature 58 will be held against adjustable contact 60, and armature 59 will be held against adjustable contact 63. The circuit will then be from the power line 64 to armature 58 and through adjustable contact 60 to signal light 56 and a Stop signal will be given to the traffic on the avenue and a Go signal to cross traffic.

When the reduced voltage causes magnet 57 to become excited armature 58 will be drawn against adjustable contact 61 while armature 59 will remain against adjustable contact 63. The circuit will then be from the power line 64 through armature 58; adjustable contact 61; armature 59; adjustable contact 63 to signal light 55 and the Caution signal will be lit.

When the full line voltage causes magnet 57 to become excited, armatures 58 and 59 will be drawn against adjustable contacts 61 and 62 respectively. The circuit will then be from power line 64 through armature 58; adjustable contact 61; armature 59; adjustable contact 62 to signal light 54 and the Go signal will be given to traffic on the avenue and a Stop signal to cross traffic.

If both armatures are drawn up close to the magnet 57 and the voltage on the magnet drops to the reduced voltage armature 59 will be pulled by the tension of its spring away from adjustable contact 62 and against adjustable contact 63 and the Caution light will again be lit.

For the proper operation of the armatures 58 and 59 it is necessary that they should not be too far away from the magnet when the magnet is not excited and they should never come into actual contact with the core of the magnet or residual magnetism might hold them. The adjustment of armature 59 is especially important since if it is too close when away from the magnet it will be drawn up when the reduced voltage is on the mag-

net. Also if armature 59 moves too close to the magnet when the full line voltage is on the magnet, then the magnet will still hold the armature against the spring when the voltage drops to the reduced voltage. The reason for having the adjustable contacts 60, 61, 62, and 63 adjustable is to regulate the extreme positions of the armatures.

The operation of signal tower 52 by switch unit 49 and the operation of signal tower 53 by switch unit 50 is the same as the operation of signal tower 51 by switch unit 48 as just described. The wiring of signal-towers 52 and 53 to their switch units is omitted for the sake of simplicity.

From the foregoing description the working of the invention should be clear, but a few general remarks on its operation will doubtless be helpful to better understand it.

The speed with which the belts 17 and 21 travel will determine the speed with which the non-stop traffic may move up and down the avenue. The reason for the speed adjustments 15 and 16 on the driving motors is to vary the speed of the belts and consequently of the traffic. A slower speed would be desirable in slippery weather. The speed of the up traffic may be regulated independently of the speed of the down traffic. It might be desirable to allow the traffic in the direction of the least travel to run faster, since there could be more space between vehicles.

It will be noted that belt 17 has more contacts on it than has belt 21. Thus if belt 17 is operating the progressive signal for traffic moving down the avenue then due to this larger number of contacts more non-stop traffic can move down the avenue than can move up. If the avenue is one of the thoroughfares leading to the suburbs there will be more traffic coming one way in the morning, and in the late afternoon the bulk of traffic would be the other way. Belts might be interchanged to get the larger number of contacts operating the signals for the bulk of the traffic. When traffic in both directions is equal, belts with equal numbers of contacts could be used.

On one-way streets the second commutator mechanism at the central control station would not be necessary.

The non-stop traffic may move at a uniform speed if the distance between the contact units 32, 33, 34, 36, 37, and 38 at the central control station is proportional to the distance between the signal towers on the avenue. If higher or lower speed between certain signal towers is desired it may be made possible by making the distance between the contact units at the central station which operate these signals towers smaller or greater respectively.

Operation of the signal towers from the central control station would be possible without a switch unit at every tower, but

by using the switch units it is possible to have only one wire from the central control station to each signal. Without the switch units 48, 49, and 50 more wires to each signal tower would be necessary and where the distance was great the expense would be very large. However this use of the commutator mechanisms is within the scope of the invention since the substitution of two contacts for the long contact on the contact units 32, 33, 34, 35, 36, 37, 38, and 39 and the necessary rewiring of the system could be made by any mechanic skilled in the art of signalling.

The use of voltages of different frequency instead of different values, and many other changes might be made in the details shown in the drawing without departing from the spirit of the invention.

The complete chronological operation of the mechanism through a cycle may be summed up by considering the operation of signal tower 51 through contact units 32 and 36. If there is no contact strip or brush

across either of these contact units 32 and 36, there will be no power furnished to magnet 57, the springs will hold armatures 58 and 59 back and the Stop signal to traffic on the highway, and the Go signal to cross traffic, 56, will be lit, using a belt such as belt 17 in which the contact strips or brushes are as closely spaced as shown, there will be no time when there is not some one of the contacts across contact unit 32. With contact strips spaced as shown on belt 21, however, there will be short intervals when there is no contact strip across contact unit 36.

The passing of the contact strips or bushes 20, 19, 18 and 65, on belt 17 over contact unit 32, comprises a cycle of operation of contact unit 32 as follows:

As indicated in the drawing this belt turns in a clockwise direction and contact strip 20 will first close the circuit between the two furthest contacts on contact unit 32. If magnetic switch 42 is open as shown in the drawing, contact strip 20 will have no effect and unless power is being furnished to magnet 57 by commutator mechanism 12 the springs will hold armatures 58 and 59 back, causing the highway Stop signal and cross traffic Go signal 56 to be lit.

When contact strip 19 closes the circuit between the middle right hand contact and the long left hand contact of contact unit 32, power will be furnished to magnet 57 with the resistance in circuit as shown in the drawing. This low voltage on magnet 57 will cause light armature 58 to be drawn up against magnet 57 and the Caution light 55 in signal tower 51 to be lit.

When contact strip 18 crosses contact unit 32 and closes the circuit between the forward right hand contact and long left hand contact of contact unit 32 the full voltage of

power line 41 will be impressed on magnet 57, both armatures 58 and 59 will be drawn up against magnet 57 and the highway Go light and cross traffic Stop light 54 will be lit.

Contact strip 65 will produce the same effect as contact strip 19 lighting Caution light 55 after the highway Go signal just as contact strip 19 lighted the Caution light before the highway Go signal.

A cycle of operation of the contact strips on belt 21 over contact unit 36 will be identical with the operation above described.

Contact strip 20 on belt 17 and contact strip 24 on belt 21 have no effect on the operation of the signals unless magnetic switches 42 or 45, respectively, are closed. Magnetic switch 42 will be closed when commutator mechanism 12 is operating the highway Go signal 54. When magnetic switch 42 is thus closed and contact strip 20 crosses contact unit 32, contact strip 20 will operate the highway Go signal until contact strip 18 crosses contact unit 32 to operate the highway Go signal.

Contact strip 24 on belt 21 operates in the same way on contact unit 36 if the highway Go signal is being operated by commutator mechanism 11 and magnetic switches 45 thereby closed when contact strip 24 crosses contact unit 36.

The object of this interrelation between the two commutator mechanisms through the magnetic switches is to prevent impractical short cross traffic Go periods as was fully described before.

I claim:

1. In a traffic signal system for regulating traffic on a highway intersected by a plurality of differently spaced cross streets electric signal means for each intersection including Go-Stop signals for the highway and for the cross streets respectively, a central control station, conductors extending from the signal means to the central control station and terminating in relatively stationary contact means having contacts for each signal means, cyclic commutator means having contacts cooperating with said first named contacts and driving means operating at a uniform speed to produce the effect of a progressively travelling Go signal along the highway, said relatively stationary contacts being spaced in accordance with the different distances between the cross streets.

2. In a traffic signal system for regulating traffic on a highway intersected by a plurality of cross streets, electric signal means for each intersection including Go-Stop signals for the highway and for the cross streets respectively, a central control station, conductors extending from the signal means to the central control station and terminating in relatively stationary contact means having contacts for each signal means, cyclic

commutator means having contacts cooperating with said first named contacts and driving means operating at a uniform speed to produce the effect of a progressively travelling Go signal along the highway, said relatively stationary contact means including means for adjusting the spacing between the contacts corresponding to the several signals with relation to the direction of the movement of the commutator means to change the timing of the signals.

3. In a traffic signal system for regulating traffic on a highway intersected by a plurality of cross streets, electric signal means for each intersection including Go-Stop signals for the highway and cross streets respectively, a central control station, separate connections between each of said signal means and said central control station, commutator mechanism in said central control station, and means to operate said commutator mechanism to change the signals progressively in opposite directions along the highway and to give signals to traffic in both directions on said cross streets.

4. In a traffic signal system for regulating traffic on a highway intersected by a plurality of cross streets, electric signal means for each intersection including Go-Stop signals for the highway and for the cross streets respectively, a central control station, a conductor extending from each of said signal means to the central control station and terminating in contact means thereat, commutator mechanism in said central control station in operative relation to said contact means, operating means for moving said commutator mechanism and said contact members with respect to each other to change the signals progressively in opposite directions along the highway, and to give signals to traffic in both directions on said cross streets.

5. In a traffic signal system for regulating traffic on a highway intersected by a plurality of cross streets, electric signal means for each intersection including Go-Stop signals for the highway and for the cross streets respectively, a central control mechanism comprising contacts arranged in a group, one of said contacts being connected with each individual signal means along the highway, commutator mechanism in operative relation to said group and driving means therefor to produce the effect of a progressively travelling Go signal up the highway, a second group of contacts, one of said contacts being connected with each individual signal means along the highway, and a second commutator mechanism in operative relation to said group and driving means therefor to produce the effect of a progressively travelling Go signal down the highway, both of said commutator mechanism including means for giving signals to cross traffic and means to

prevent a Go signal to cross traffic when the beginning of the Go period by one commutator mechanism follows the end of the Go period by the other commutator mechanism by less than a predetermined time interval. 70

6. In a traffic signal system for regulating traffic on a highway, intersected by a plurality of cross streets, electric signal means for each intersection comprising a common Go and a common Stop signal for both directions along the highway, a central control mechanism for operating said signal means, independent contact units in said central control mechanism for each signal means, means in operative relation to said contact units to produce progressive signals in both directions along the street by the use of the common set of signals. 75

7. In a traffic signal system for regulating traffic on a highway intersected by a plurality of cross streets, electric signal means for each intersection including Go-Stop signals for the highway and cross streets respectively, a central control station, a conductor from each of said signal means to said central control station terminating in contact means thereat, commutator mechanism cooperating with said contact means and means driving said commutator mechanism to produce the effect of a progressively travelling Go signal up the highway, a second commutator mechanism cooperating with said contact means and means driving said second commutator mechanism to produce the effect of a progressively travelling Go signal down the highway, both of said commutator mechanisms operating the same set of signals. 85 90 95 100

8. In a traffic signal system for regulating traffic on a highway intersected by a plurality of cross streets, electric signal means for each intersection including common Go signals for both directions along the highway, a central control station, a separate conductor from each signal means to said central control station, each conductor terminating in a pair of contact units, all of the said contact units at the central control station being divided into two groups and each signal means having one of its contact units in each group, commutator mechanism for each group of contact units for operating said signal means from said conductors, and means for operating said commutator mechanisms, both of said commutator mechanisms operating the common set of signals. 105 110 115 120

9. In a traffic signal system for regulating traffic on a highway intersected by a plurality of cross streets, electric signal means for each intersection including Go-Stop signals for the highway and cross streets respectively, a central control station, a separate connection between each of said signal means and said central control station, commutator mechanism and driving means 125 130

therefor in said central control station for operating on said connections to the individual signal means to produce the effect of a progressively travelling Go signal up the highway, other commutator mechanism and driving means therefor in said central control station operating on said connections to

the individual signal means to produce the effect of a progressively travelling Go signal down the highway, signals for cross traffic operated by both the said commutator mechanisms jointly.

In testimony whereof I affix my signature.
CHARLES W. NEILL.

DISCLAIMER

1,723,062.—*Charles W. Neill*, Washington, D. C. TRAFFIC-SIGNAL-CONTROL MECHANISM. Patent dated August 6, 1929. Disclaimer filed December 16, 1931, by the assignee, *Crouse-Hinds Company*.

Hereby enters this disclaimer restricting claims 3 and 4 as follows:

By restricting the limitation "and to give signals to traffic in both directions on said cross streets" of said claim 3 to *and to give like signals simultaneously to traffic in both directions on said cross streets*.

By restricting the limitation "and to give signals to traffic in both directions on said cross streets" of said claim 4 to *and to give like signals simultaneously to traffic in both directions on said cross streets*.

[*Official Gazette January 5, 1932.*]