Aug. 6, 1929. C. W. NEILL ET AL 1,723,060

TRAFFIC SIGNAL SYSTEM

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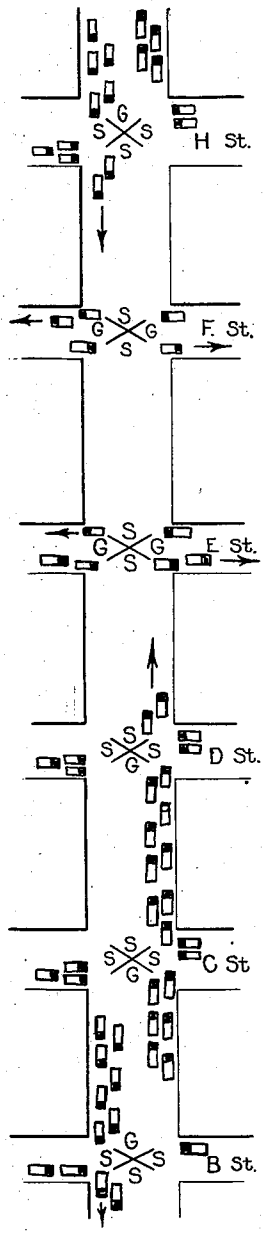


Fig. 1.

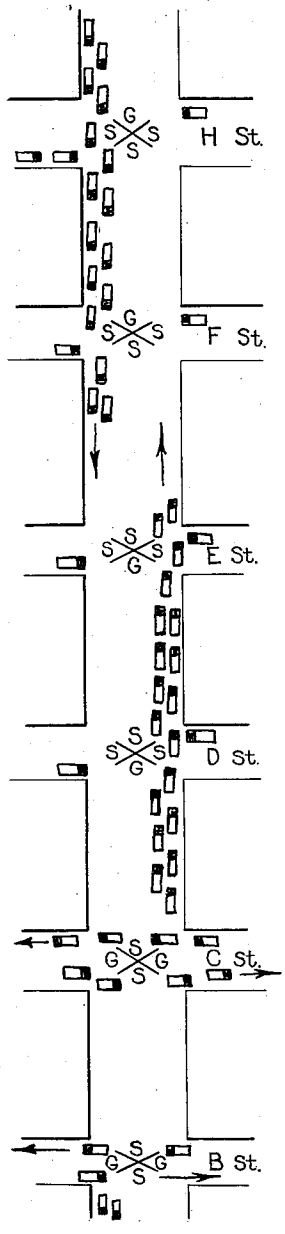


Fig. 2.

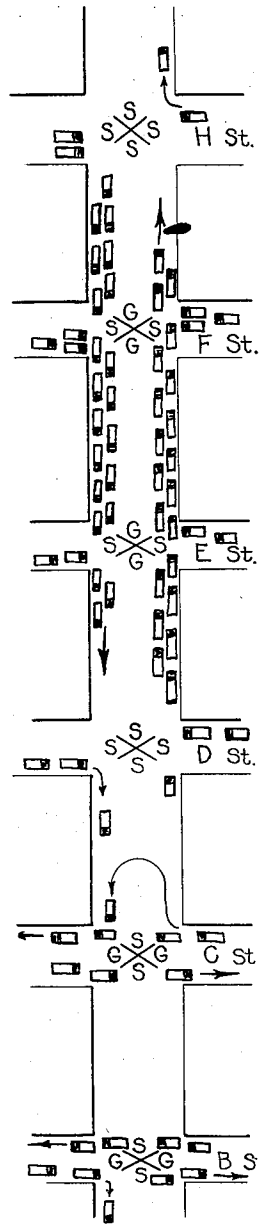


Fig. 3.

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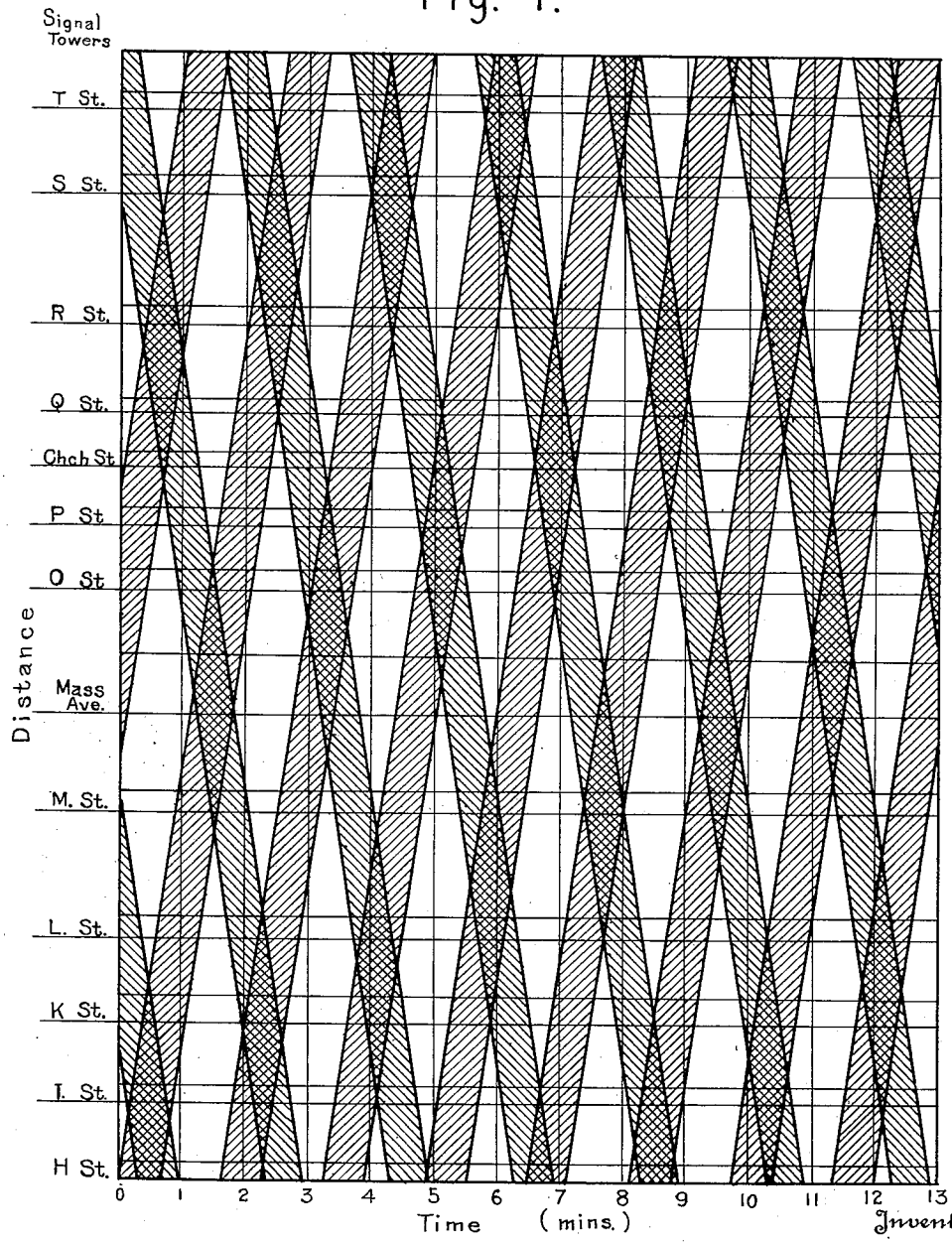
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Fig. 4.



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Fig. 5.

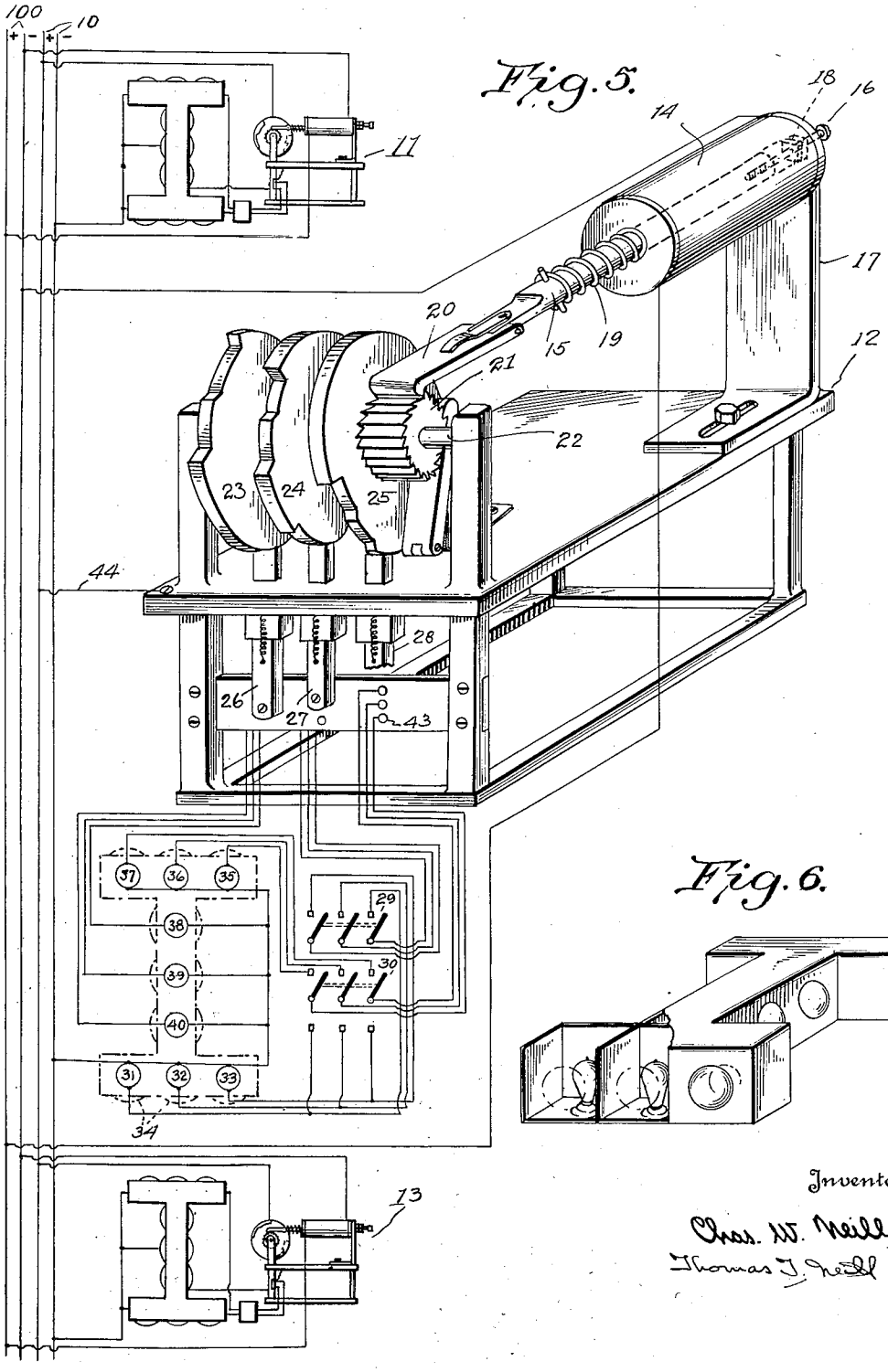


Fig. 6.

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Patented Aug. 6, 1929. 1,723,060

UNITED STATES PATENT OFFICE.

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TRAFFIC-SIGNAL SYSTEM.

Application filed July 22, 1925. Serial No. 45,334.

Our invention relates to improvements in the regulation of street traffic. It has been found expedient in all large cities, to use traffic signals at the intersections of busy streets. The common method of handling traffic at such intersections is to employ a traffic policeman who stops the traffic on each intersecting street while the traffic on the other street crosses. The policeman at such crossings are often provided with signals to give directions to the drivers. The chief objection to this method of traffic directing is that, in the busy sections, where there is a signal at every corner, a vehicle may have to stop at every cross street to wait for a Go signal.

An improved system now used in some cities provides signals which are electrically controlled and which all change at the same time thus allowing the traffic throughout the entire length of the street to move at once. The vehicles all move as far as they can before the signals all turn to Stop and allow the traffic on the cross streets to move. While this electrical signal system may allow the traffic to move further between stops it should be noted that the traffic must stop at times and the tying up of the cross traffic may make the system impracticable on streets which are crossed by equally important streets.

The object of our invention is to provide a signal system for directing street traffic so that the traffic on the streets equipped with our signals can keep moving at a given speed and never have to stop at the cross streets. A further object of our invention is to provide a signal system for directing street traffic, so arranged that while the traffic on one street moves continuously the intersections will be open part of the time for cross traffic. The advantages of the system are a saving in time for vehicle operators and a lessening of traffic congestion. Other objects and advantages will appear as the description proceeds.

The signal system and operating means are illustrated in the accompanying drawings, in which—

Fig. 1 indicates a thoroughfare equipped with signal devices and provided with signals in accordance with the invention. In this figure the signals are represented as they appear at a given interval of time. Fig. 2 indicates the same thoroughfare and signals as they appear at a later interval, that is, a few seconds later than the interval represented in Fig. 1, and Fig. 3 indicates the same thoroughfare and signals as they appear at a still later interval, that is, a few seconds later than the interval represented in Fig. 2.

Fig. 4 illustrates the method in which the signals along a given street are worked out on time-distance coordinates.

Fig. 5 illustrates a wiring diagram of a portion of the signal system. Operating mechanism for one of the signals is also shown in Fig. 5.

Fig. 6 is a view in perspective, of a portion of a signal device.

Fig. 1 illustrates an avenue having cross streets B, C, D, E, F, and H. Each intersection is equipped with a signal tower. The signal indication to the approaching traffic is illustrated as S for Stop and G for Go. For example the B street signal tower in Fig. 1 indicates Go to traffic moving down the avenue and Stop to up traffic and cross traffic.

In Fig. 1 a two-block train of up-town traffic is shown crossing C and D streets. The rear end of a similar train of up-town traffic is represented as having crossed H street. The distance between the up-town trains is three blocks. The rear end of a down-town train is shown crossing B street, while the front end of a similar train is shown crossing H street. The lengths of down-town trains along the thoroughfare indicated in Figs. 1, 2 and 3 are the same as the lengths of the up-town trains, but the distance between down trains is longer, four blocks being indicated in the drawing. The reason for this difference will hereinafter more fully appear in connection with the description of Fig. 4. As indicated in Fig. 1, the signals at cross streets E and F indicate that traffic may proceed along these cross streets.

Fig. 2 illustrates the avenue shown in Fig. 1 a few seconds later. The trains of traffic have moved forward one block and it should be noted that the Go and Stop signal indications for the avenue traffic have progressed in the direction in which the traffic they di-

rect is moving. For example, while the first vehicle in the up train is moving for D street to E street the E street signal indication which was Stop in Fig. 1 has changed to Go as in Fig. 2 and before this first vehicle reaches F street the Stop signal indication at F street will have changed to Go as in Fig. 3.

If the Go signal indications progresses up the avenue at the rate of 30 miles per hour, for example, and if all of the vehicles in a train travel 30 miles per hour, the whole train can travel the entire length of the avenut without a stop. However, if some vehicles should get ahead of the train by running faster than 30 miles per hour, they will come to a signal which will stop them.

The Stop signal indications at the end of a traffic train will progress, so to speak, in the same direction and at the same speed as the Go signal indications ahead of the train. Therefore, if the last vehicle in a train runs less than 30 miles an hour, for example, the Stop signal indication will overtake it, so to speak. For example, the last vehicle in the uptrain in Fig. 3 has run too slow and has been cut off at D street. This vehicle will have to wait for the signal indication to change again at D street which will be when the front end of the next or following up train, Fig. 3, reaches a point somewhere between C and D streets.

Fig. 3 shows also, vehicles making right hand turns at B, D, and H streets. Left hand turns may be made also if the cross traffic is not too heavy; or a vehicle could turn to the right first, and then make a left hand turn when not at the intersection, as shown at C street in Fig. 3.

Fig. 4 is a time-distance chart showing the time relation of the signals along a thoroughfare, with respect to each other, that is, the time each comes on and the time each goes off over a given period as, for example, over a period of thirteen seconds. It also illustrates the distance the signals are located one from the other. This figure also indicates the rate at which the vehicles must travel that the object of the invention may be accomplished. This rate of travel is represented by the sloping bands, the bands sloping upward and to the right representing travel in one direction, such as up-town traffic and the opposite traffic by the bands sloping in the opposite direction. Fig. 5 shows three signal devices each with its set of signals for one of the intersections of Fig. 1 along a highway as, for example at intersections B, C and D. In this figure a controller is indicated for each signal device. One of the controllers is shown in perspective and in considerable detail and the interconnecting wiring between the controller and the signals of its signal device are also shown in detail. In this figure the three signal devices are shown interconnected as they are in a system such as indicated by Fig. 1. Fig. 6 is a view in perspective of one of the signal devices, Fig. 5.

An example of the use of the graph in Fig. 4 may be helpful to better understanding of the graph. Taking M street for an example, at a given time (zero time line of the graph) the intersection of M street and the signal street is open to M street traffic. Moving to the right we find that after about 55 seconds an up train on the signal street starts across the intersection; and before the end of this up train has crossed the intersection, a down train starts across. At the 2 minute line we find the intersection again open to M street traffic. This open space is about ½ minute in duration and is ended by an up train crossing the intersection. There is a short open space after which a down train crosses. Almost immediately following the crossing of this down train, another up train reaches the intersection. It will be noted that the time between the two last mentioned trains, during which M street is open, is very short.

Since the M street traffic would hardly have time to start before the signal would turn against it, the signal apparatus would be arranged so as not to change the signal when the change would be of such a short duration as to be useless. This is a question of the design of the operating cams, or their setting so as to depart slightly from the timing indicated by the uniform speed lines of the graph in Fig. 4. This result is accomplished by departing slightly from the timing indicated by the graph and setting the cams so as to eliminate the short period at this intersection or by setting the cams the other way so as to lengthen it into a useful interval. It will be noticed on the graph that at the end of about eight minutes a complete operating cycle of Stop-Go periods has been completed, and a new operating cycle starts. It will be noted that although the complete operating cycle in Fig. 4 is approximately 8 mins. the up traffic signals go through 5 cycles during these 8 mins., while the down traffic signals go through 4 cycles. Mathematically, the time of the complete operating cycle will always be the least common multiple of the time of the up traffic signal cycle and the time of the down traffic signal cycle. The mechanism for operating the cross street signals must operate through a complete operating cycle and then repeat. Thus if a rotary cam operates the mechanism the cam would have to operate at a speed of approximately one-eighth revolution per minute. The cycle of operation for the up or down signals is much shorter than the cycle of operation for the cross traffic signals. For example in a machine, such as shown in Fig. 5, with cams to control the traffic signals according

to Fig. 4, the cams would run at a speed of 1/8th R. P. M. The cross traffic signal control cam would be so designed as to cause the proper signal indication changes called for by Fig. 4 during a complete operating cycle of 8 mins. The up traffic signal control cam, however, though turning at the same speed, would cause the up traffic signals to go through 5 cycles in 8 mins. The down traffic signal control cam would cause the down traffic signals to go through 4 cycles in 8 mins., as previously explained.

The graph in Fig. 4 is for a particular street having cross streets of various widths and with various distances between cross streets. The up and down trains move at the same speed and are of the same lengths. Fig. 4 illustrates one application of the progressive signal system; though obviously train lengths, stop lengths, speeds, and many other values may be changed. We do not in any way limit ourselves to the specific application of the system as illustrated in Fig. 4.

Fig. 5 illustrates a wiring diagram for the signal system. In the system illustrated electric power lines 10 and 100 run the length of the street and the light circuits of the signal devices, at the various street intersections, are connected in parallel to power line 10 while the magnetic signal changing mechanisms are connected in parallel to power line 100.

All of the electrical energy may be furnished from a central control station.

While an electrical connection between the signals seems preferable, any other suitable power transmitting means may be employed.

The wiring of the lights and the mechanism for controlling the switches is illustrated in Fig. 5. Signal devices 11 and 13 are shown diagrammatically but signal device 12 is shown in detail and its operation will now be described.

A solenoid 14 is equipped with a plunger 15 which slides within the solenoid. A screw 16 passes through a solenoid supporting plate 17 and is threaded into the plunger 15. Movement of the plunger in one direction is limited when the plunger strikes against the supporting plate 17. Movement of the plunger in the other direction is limited by an adjustable stop 18 threaded on screw 16. The plunger is held in the outward position by a spring 19.

A very low frequency alternating current or a pulsating current is made to flow through the solenoid 14. When the solenoid is excited, plunger 15 is pulled in; when the current stops flowing in the solenoid the plunger will be pushed back by spring 19. This plunger 15 has imparted to it a reciprocating motion. A pawl 20, suitably attached to the plunger 15, operates a ratchet mechanism 21 which turns a shaft 22. Suitably mounted on shaft 22 are cam disks 23, 24 and 25. The intermittent motion of the ratchet wheel is imparted to the cam disks. The cam disks are provided with followers 26, 27 and 28. The followers work in suitable guides and each follower is provided with a contact which slides over three other contacts as the follower moves up and down.

Cam disk 23 controls the signal lights for directing the cross traffic while cam disks 24 and 25 control the lights for directing the up and down traffic.

Fig. 5 shows the signal at each intersection provided with nine lights. Lights 31, 32, and 33 show through colored glass bull's eyes 34 and direct up traffic. These lights 31, 32 and 33 are visible to up traffic only. Light 31 shines through a red bull's eye and indicates Stop; light 32 shines through a green bull's eye and indicates Ready; light 33 shines through a clear bull's eye and indicates Go. A similar set of lights 35, 36 and 37 for directing down traffic are mounted at the side of the signal device opposite the up traffic lights. Since the signal for cross traffic from one direction is always the same as for traffic from the opposite direction, a single set of lights 38, 39 and 40 directs cross traffic from both directions.

When the cam disk 25 is controlling lights 31, 32 and 33, the contact on follower 28 will register with contact 41 when the follower is in its uppermost position and light 33 will be lit while lights 31 and 32 will be out. The circuit when light 33 is lit is from power line 10 through line 44 to the frame of the control mechanism; through the body of the control mechanism to the contact on follower 28; through the contact 41 to switch 30; from switch 30 to light 33 and then to the power line 10.

The use of the Ready signal seems desirable to warn vehicle operators before the signal changes from Stop to Go. Such a warning will enable traffic to follow more closely behind the progressing signal indication. While the signal indication change mechanism in Fig. 5 will also light the Ready signal when changing from Go to Stop, the cam disk is so designed that it will light the Ready signal for a short period when changing from Stop to Go and pass rapidly over the Ready contact, so that the signal will only flash, when changing from Go to Stop.

So far as directing the traffic is concerned the Ready signal means the same as does the Stop signal. To make the system more easily understood the use of the Ready signal was omitted in Figs. 1–4. Its application to these figures after the figures themselves are understood seems obvious.

Fig. 6. shows the housing for the signal lights partly broken away to show the lights.

It will be understood that in order to produce signals of uniform lengths, such as indicated by the sloping shaded bands in Fig. 4, the cams 24 and 25, Fig. 5, which are provided at each one of the intersections along the main thoroughfare, will be the same, but if the cams are made so that the duration of the Go signal, for example, is different at one intersection, intersection M, for example, from that of any other intersection, the sloping shaded bands in Fig. 4 will not have both sides parallel. If the interval of the Go signal indication is shorter at the intersection M than at the intersections L or O then the band will contract toward street M. On the other hand, if the cam that controls the Go signal indication is made so that the Go signal indication at street M will persist a longer interval of time than at streets L or O the band will broaden from streets L or O toward street M. Therefore, by arranging different cams at the different intersections the periods between signal indication changes may be made of different lengths.

The advantage of having the signals timed in accordance with the shaded bands in Fig. 4 so that the bands that represent traffic in one direction are closer together than the bands that represent traffic in the opposite direction is that regardless of whether the cross streets are the same distance apart or of varying distances apart, suitable Go signal indications are insured to every cross street so that at least some traffic can go through. This would not otherwise be the case. For example, if the bands in both directions were spaced the same distance apart the white diamond shaped sections instead of appearing in rows that slope upward and to the right, would appear in rows extending directly across from left to right. As a result some of the cross streets might fall at points where the shaded bands would leave a white portion of insufficient width to permit cross traffic to pass. Such a condition, of course, could not be permitted. In other words, if there were no variation such as indicated in Fig. 4 in the spacings of the bands some cross streets would have all long Go periods and other cross streets would have all very short Go periods, or no Go periods at all. Applicants' invention, therefore, avoids such an objectionable condition.

Another advantage of having the bands representing traffic in one direction closer together than the bands representing traffic in the other direction is that there are more groups of traffic per mile of street moving in the direction represented by the closer spaced bands. This permits the signals to favor traffic in the direction from which the heaviest flow comes as for example into the city during the morning rush hours.

We have described one application of our system and mechanism for operating the same on a single street. The operation of the system on two streets which cross one another is obviously a question of fitting together graphs similar to Fig. 4, and varying values until the two systems fit together. Other applications and operating mechanism may be employed without departing from the scope of the claims.

We claim—

1. In a street traffic signal system, signal stations spaced along the highway, Stop and Go signals at each signal station for directing up traffic, Stop and Go signals at each intersection for directing down traffic, Stop and Go signals for cross traffic, control mechanism for each signal station for cyclicly changing the signal indications for up traffic, independent of the corresponding control mechanism for the other signal stations, so that it may be set with relation to the corresponding control mechanisms, for other signal stations to cause when operated a Go signal indication to progress ahead of traffic moving up the highway and control mechanism for each signal station for cyclicly changing signal indications for down traffic, independent of the corresponding control mechanism for the other signal stations so that it may be set with relation to the corresponding control mechanism for other signal stations to cause when operated a Go signal indication to progress ahead of traffic moving down the highway and means operating in set relation to both said up traffic signal control mechanism and said down traffic signal control mechanism to change the signal indications for cross traffic, and means for operating said control means in unison.

2. In a signalling system for regulating traffic on a highway intersected by a plurality of cross streets, signal means for directing traffic at the intersections comprising separate sets of Go and Stop signals for independently signalling traffic moving in opposite directions along the highway, and Go and Stop signals for signalling cross street traffic, means for controlling said signals for causing alternate groups of Stop and Go signal indications to appear to move in one direction along the highway, controlling others of said signals for causing alternate groups of Go and Stop signal indications to appear to move along the highway in the opposite direction so as to cause a Stop signal to be set against traffic in both directions on the highway at recurring intervals of time at any intersection, and for causing the cross street Go signal indication to be given during that interval, at that intersection and for causing the cross street stop signal indication to be given at all other times mentioned; including separate signal operating mechanism for each intersection

along the highway for operating the signals thereat, each operating mechanism including separate means for controlling the progressive up signal indications and the progressive down signal indications, a motor and driving means between the motor and the controlling means including mechanism by which the controlling means for each signal may be set independently of the controlling means for any other signal.

3. In a traffic signal system for regulating traffic along a highway intersected by a series of roads, a signal device at each intersection for regulating traffic along the highway and along the cross-road, each of said signal devices having separate sets of Stop and Go signals for traffic moving up and down the highway, and Stop and Go signals for the cross-road, separate signal control mechanism located at each intersection along the highway for controlling the signals thereat, including cam means in each controlling mechanism for changing the signal indications for up traffic on the highway, a second cam means in each controlling mechanism, set independently of the first cam means, for changing the signal indication for down traffic on the highway, means for changing the signal indication for traffic on the cross road: a motor at each intersection, driving means between each motor and its corresponding signal controlling mechanism including means by which the controlling mechanism at that intersection may be set independently of the controlling mechanism at the other intersections so that all of the cam means for changing the signal indications directing up traffic may be set with relation to each other to change the signal indications progressively up the highway and all of the cam means for changing the signal indications directing down traffic may be set with relation to each other to change the signal indications progressively down the highway, and means for operating said motors in synchronism.

4. The method of operating a traffic signalling system for a highway intersected by a plurality of cross roads, in which signals are located at intersections, each signal comprising Go-Stop signals for controlling traffic in one direction along the highway and other Go-Stop signals for controlling traffic in the opposite direction along the highway, which method consists in operating the Go signals for traffic in one direction in cycles and the Go signals for traffic in the opposite direction in different cycles and in causing the Go signal indications for traffic in one direction and the Go signal indications for traffic in the opposite direction along the highway to appear progressively in the direction of the corresponding traffic and in such timed relation that there will be recurring intervals of time at each intersection, when there is no Go signal indication being given to either up or down highway traffic and in causing a Go signal indication to cross road traffic, and Stop signal indication to highway traffic, to be given at the intersection during said recurring intervals of time.

5. The method of regulating traffic on a highway intersected by a plurality of cross-streets and having signal units comprising Stop and Go signals for the intersections for signalling traffic moving up and down the highway and on the cross-streets, which method consists in causing a Go signal indication to appear at successive signal units progressively up the highway, ahead of traffic moving up the highway, the Go signal indication of each signal unit to appear after the Go signal indication at the preceding signal unit along the highway and to persist until after the Go signal indication appears at the next signal unit along the highway and to be followed after a predetermined length of time by Stop signal indication and in causing a Go signal indication to appear at successive signal units progressively down the highway ahead of traffic moving down the highway and in such timed relation with respect to said Go signal indication progressing up the highway that there will be recurring intervals of time at the signal unit at each intersection when there is no Go signal indication given to either up or down highway traffic and in causing a Go signal indication to cross-street traffic to be given at each signal unit during said recurring intervals of time.

6. The method of operating a traffic signalling system, for a highway intersected by a plurality of cross streets, having signals for directing traffic at the intersections, said signals comprising Go-Stop signals for the highway and Go-Stop signals for the cross streets, which method consists in causing a Go signal indication to appear at successive signal units progressively up the highway, said Go signals at each signal unit being operated in cycles, and in causing a Go signal indication to appear at successive signal units progressively down the highway, said Go signals at each signal unit being operated in cycles and in making said first mentioned cycles different from said last mentioned cycles so that there will be recurring intervals of time at each signal unit when there is no Go signal indication being given to highway traffic, and in causing a Go signal indication to be given to cross street traffic and a Stop signal indication to highway traffic during said recurring intervals of time.

7. The method of operating a traffic signalling system, for a highway intersected by a plurality of cross streets, having signals for directing traffic at the intersections, said

signals comprising Go-Stop signals for the highway and Go-Stop signals for the cross streets, which method consists in causing a Go signal indication to appear at successive signal units progressively up the highway, said Go signal indication at each signal unit persisting until after the Go signal indication appears at the next succeeding signal unit, and in causing a Go signal indication to appear at successive signal units progressively down the highway, and in so timing said Go signal indications which progress up the highway with respect to said Go signal indications which progress down the highway that there will be recurring intervals of time at each signal unit when there is no Go signal indication being given to highway traffic, and in causing a Go signal indication to be given to cross street traffic, and a Stop signal indication to highway traffic during said recurring intervals of time.

8. In a signalling system for regulating traffic on a highway intersected by a plurality of cross streets, signals at the intersections comprising separate sets of Go and Stop signals for independently signalling traffic moving in opposite directions along the highway and Go and Stop signals for signalling cross street traffic, means for controlling certain of said signals for causing alternate groups of Stop and Go signal indications to appear to move in one direction along the highway, controlling others of said signals for causing alternate groups of Go and Stop signal indications to appear to move along the highway in the opposite direction so as to cause a Stop signal indication to be set against traffic in both directions on the highway at recurring intervals of time at any intersection, and for causing the cross street Go signal indication to be given during that interval, at that intersection and for causing the cross street Stop signal indication to be given at all other times mentioned; including separate signal operating mechanism for each intersection along the highway for operating the signals thereat, each operating mechanism including independently set means for controlling the up signals and the down signals, a motor and driving means between the motor and the controlling means including mechanism by which the controlling means for each signal may be set independently of the controlling means for any other signal.

9. In a signalling system for regulating traffic on a highway intersected by a plurality of cross streets, signals for directing traffic at the intersections comprising Stop-Go signals for the highway and Stop-Go signals for the cross streets, means for controlling said signals which may be operated to cause Go signal indications to appear to move in opposite directions along the highway and to cause a Stop signal indication to be given traffic in both directions on the highway at recurring intervals of time at each intersection and to cause the cross street Go signal indications to be given during that interval at that intersection and for causing the cross street Stop signal indication to be given at all other times mentioned, said controlling means including separate means for causing the Go signal indications to appear to move in opposite directions, mechanism for operating said signal controlling means including motor means and driving means between the motor means and the signal controlling means including mechanism by which the means for causing the Go signal indications to appear to move in opposite directions may be set independently of one another.

10. In a signalling system for regulating traffic on a highway intersected by a plurality of cross streets, signals for directing traffic at the intersections comprising Stop-Go signals for the highway and Stop-Go signals for the cross street, signal control means for each intersection including means for cyclicly causing the highway Go signal indication and independently set means for also cyclicly causing a highway Go signal indication, and means for causing a highway Stop signal indication and a cross traffic Go signal indication at intervals when neither of said first mentioned means is causing a highway Go signal indication, mechanism for operating said signal control means including motor means and driving means between the motor and signal control means for each intersection, said driving means including mechanism by which the signal control means for each intersection may be set independently of the controlling means for any other intersection.

11. In a signalling system for regulating traffic on a highway intersected by a plurality of cross streets, Stop-Go signals for each intersection for directing traffic moving in one direction along the highway, separate Stop-Go signals for directing traffic moving in the opposite directions along the highway, and additional Stop-Go signals for directing cross street traffic, means for controlling the signals which direct traffic moving in one direction along the highway, to produce, when operated, alternate groups of Go and Stop signal indications which appear progressively along the highway in that direction, means for controlling the signals which direct traffic moving in the opposite direction along the highway, to produce, when operated, alternate groups of Go and Stop signal indications, whose relative lengths may differ from those of the first mentioned signal indications which appear progressively along the highway in the opposite direction whereby there will always

be at least one recurring interval of time at each intersection when both highway Stop signals will be set against traffic, means for controlling the cross street signals, to produce, when operated, a cross street Go signal indication at each intersection at each of said recurring intervals of time and means for operating said controlling means in timed relation whereby the signals at each intersection go through a complete operating cycle in the same time.

12. In a traffic signalling system for regulating traffic along a highway intersected by a plurality of cross streets, a signalling unit at each intersection comprising current responsive signals and a motor operated controller therefor, said signals comprising Go and Stop signals for directing traffic moving up the highway, separate Go and Stop signals for directing traffic moving down the highway, and separate Go and Stop signals for directing cross traffic in both directions, said controller comprising a separate two position switch for each pair of Go and Stop signals, means including a source of current, for completing a circuit to each Go signal when its respective switch is in one position, and for completing a circuit to each Stop signal when its respective switch is in its other position, separate means for alternately moving each switch from one position to the other, means operatively connecting said separate switch operating means to said motor, the connecting means between each switch operating means and motor being independently adjustable, the switch operating means for the cross traffic signal being adjusted to operate a Go signal when the highway signals in both directions give a Stop signal indication and to give a Stop signal indication when the highway signals in either direction give a Go signal indication, and means for keeping said motors in synchronism.

13. In a street traffic signal system, signal stations spaced along the street, Stop and Go signals at each signal station for directing highway traffic, Stop and Go signals for directing cross traffic, control mechanism for each signal station for cyclicly changing the signal indications for up traffic, independent of the corresponding control mechanism for the other signal stations, so that it may be set with relation to the corresponding control mechanisms, for other signal stations to cause when operated a Go signal indication to progress ahead of traffic moving up the street, and control mechanism for each signal station for cyclicly changing signal indications for down traffic, independent of the corresponding control mechanism for the other signal stations so that it may be set with relation to the corresponding controlling mechanisms for other signal stations to cause when operated a Go signal indication to progress ahead of traffic moving down the street, control means to change the signal indications for cross traffic, and means for operating all of said control means in unison.

14. In a signalling system for regulating traffic on a highway intersected by a plurality of cross streets, signal means for directing traffic at the intersections, comprising Go and Stop signals for signalling traffic moving in opposite directions along the highway and Go and Stop signals for signalling cross street traffic, means for controlling said signals for causing groups of Go signal indications to appear to move in one direction along the highway, and for causing Go signal indications to appear to move along the highway in the opposite direction so as to cause the omission of the Go signal indication to traffic on the highway at recurring intervals of time at any intersection, and for causing the highway Stop signal indication and the cross street Go signal indication to be given during that interval, at that intersection, and for causing the cross street Stop signal indication to be given at all other times mentioned; including separate signal operating mechanism for each intersection along the highway for operating the signals thereat, each operating mechanism including separate means for controlling the progressive up signal indications and the progressive down signal indications, a motor and driving means between the motor and the controlling means including mechanism by which the controlling means for each signal may be set independently of the controlling means for any other signal.

15. In a street traffic signalling system for regulating traffic along a highway intersected by a series of cross roads, signal devices at intersections for regulating traffic along the highway and along the cross roads, each of said signal devices having Stop and Go signals for traffic moving up and down the highway, and Stop and Go signals for the cross road, separate signal control mechanism for each signal device along the highway for controlling the signals thereat, including a first cam means in each controlling mechanism for changing the signal indication on the highway, a second cam means in each controlling mechanism, set independently of the first cam means, for changing the signal indication on the highway, means for changing the signal indication for traffic on the cross road; a motor for each signal device, driving means between each motor and its corresponding signal controlling mechanism, including means by which the controlling mechanism for that intersection may be set independently of the controlling mechanism for the other intersections, so that all

of the first cam means may be set with relation to each other to change the signal indications progressively up the street, and all of the second cam means may be set with relation to each other to change the signal indications progressively down the street, and means for operating said motors in synchronism.

16. The method of operating a traffic signalling system for a highway intersected by a plurality of cross roads, in which signals direct traffic at the intersections, each signal comprising Go and Stop signals for controlling traffic in both directions along the highway, and in which Go signal indications appear to move progressively in both directions along the highway, which method consists in operating the Go signals for traffic from one direction in cycles and the Go signals for traffic from the opposite direction in different cycles, and in causing the Go signal indications for traffic from one direction and the Go signal indications for traffic from the opposite direction along the highway to appear progressively in the direction of the corresponding traffic and in such timed relation that there will be recurring intervals of time at each intersection when there is no Go signal indication being given for either up or down highway traffic and in causing a Go signal indication to cross road traffic, and Stop signal indication to highway traffic, to be given at the intersection during said recurring intervals of time.

17. In a signalling system for regulating traffic on a highway, intersected by a plurality of cross streets, signals for directing traffic at the intersections comprising Go and Stop signals for signalling traffic moving in opposite directions along the highway, and Go and Stop signals for signalling cross street traffic, means for controlling said signals for causing groups of Go signal indications to appear to move in one direction along the highway, and controlling said signals for causing Go signals indications to appear to move along the highway in the opposite direction, so as to cause the omission of a Go signal indication for traffic in either direction along the highway at recurring intervals of time at any intersection, and for causing the cross street Go signal indication and highway Stop signal indication to be given during that interval, at that intersection, and for causing the cross street Stop signal indication to be given at all other times mentioned; including separate signal operating mechanism for each intersection along the highway for operating the signals thereat, each operating mechanism including independently set means for controlling the up signal indications and the down signal indications, a motor and driving means between the motor and the controlling means including mechanism by which the controlling means for each signal may be set independently of the controlling means for any other signal.

18. In a signalling system for regulating traffic on a highway intersected by a plurality of cross streets, Stop and Go signals for each intersection for directing traffic moving in opposite directions along the highway, and Stop and Go signals for directing cross street traffic, means for controlling the signals which direct traffic moving along the highway, to produce, when operated, groups of Go signal indications which appear progressively along the highway in one direction, and Go signal indications, whose relative periods may differ from those of the first mentioned signal indications, which appear progressively along the highway in the opposite direction, so that there will always be at least one recurring interval of time at each intersection when no highway Go signal indication will be given to highway traffic, means for controlling the cross street signals, to produce, when operated, a cross street Go signal indication at each intersection at each of said recurring intervals of time and means for operating said controlling means in timed relation whereby the signal indications at each intersection go through a complete operating cycle in the same time.

In testimony whereof we affix our signatures.

CHARLES W. NEILL.
THOMAS T. NEILL.