

Aug. 4, 1931.

A. J. MASSEY

1,817,754

TRAFFIC SIGNALING SYSTEM

Filed June 25, 1923

3 Sheets-Sheet 1

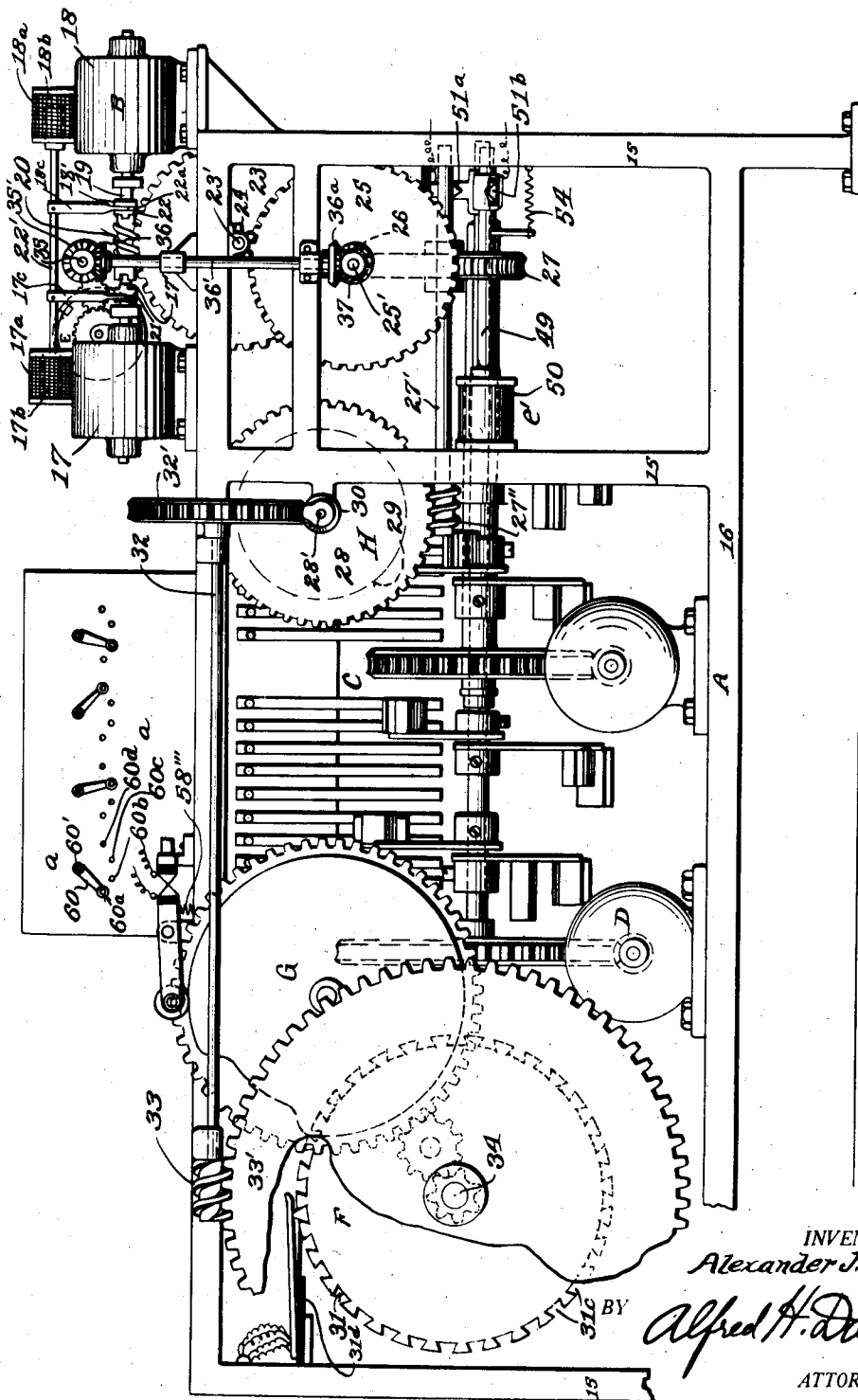


Fig. 1.

INVENTOR.

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Aug. 4, 1931.

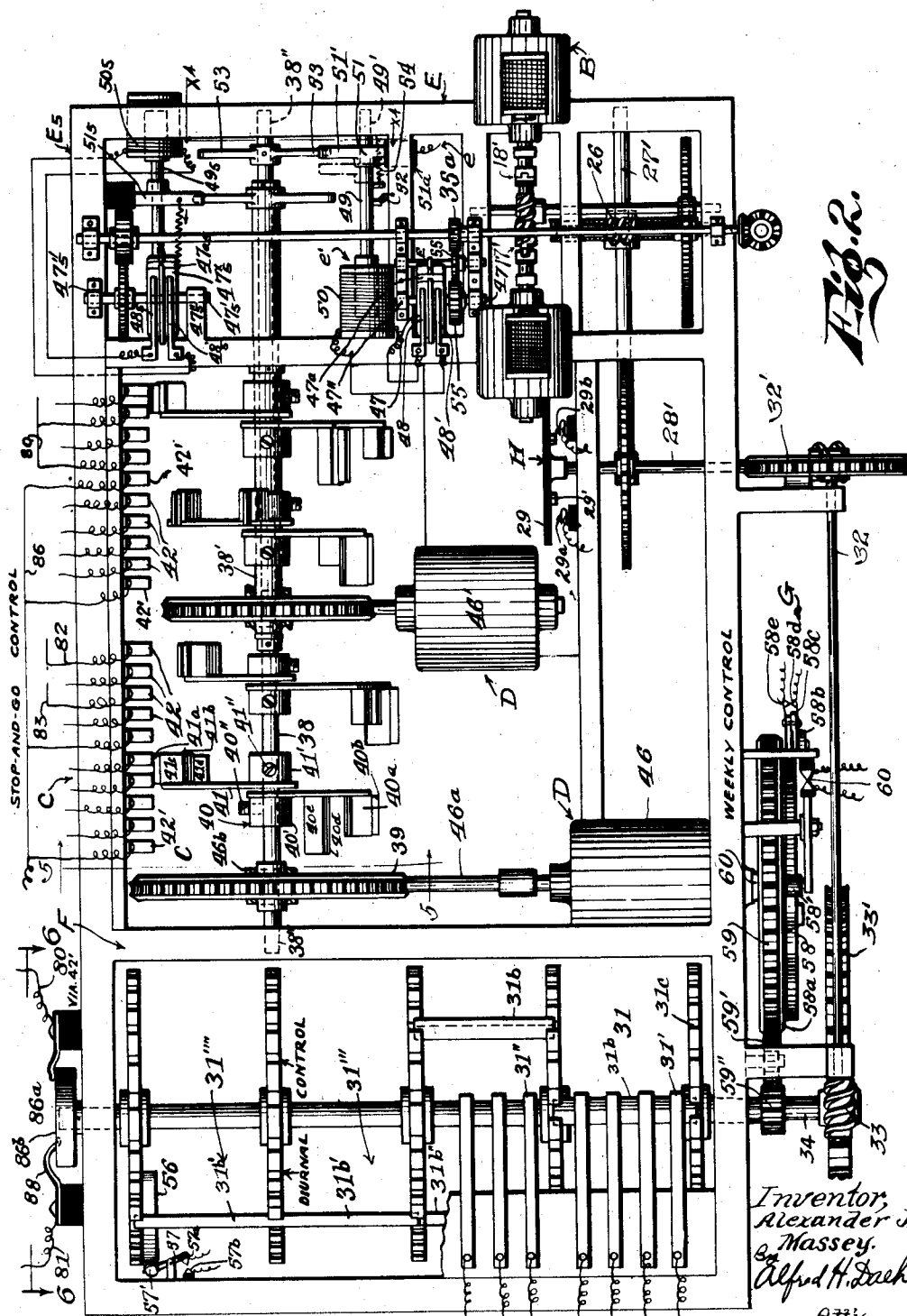
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3 Sheets-Sheet 2



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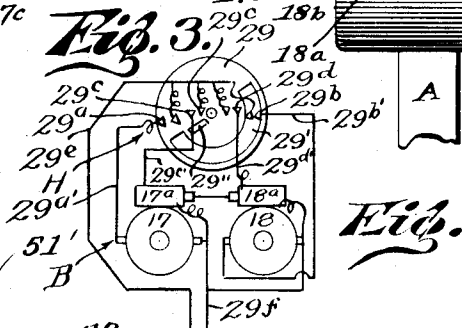
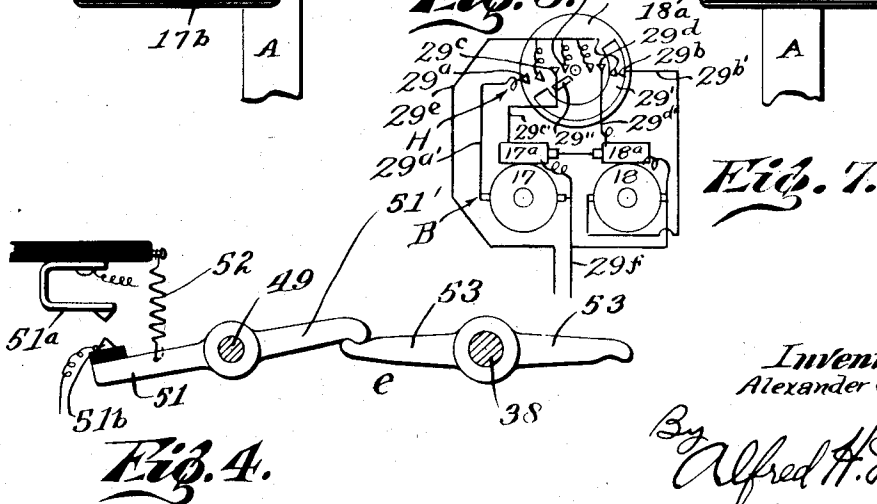
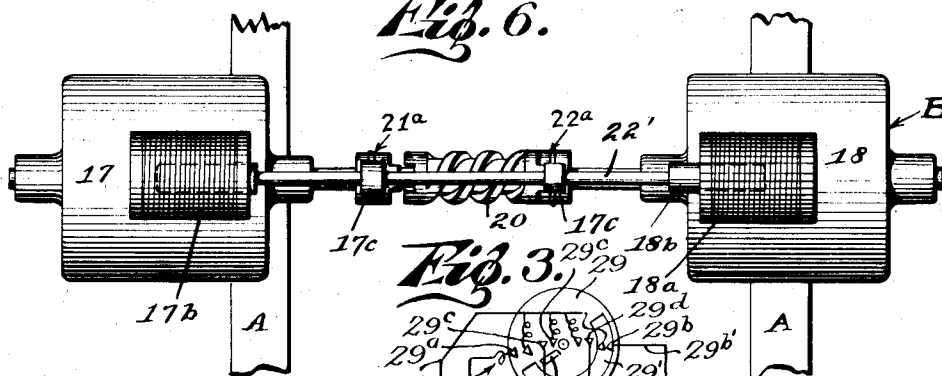
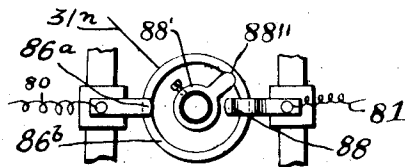
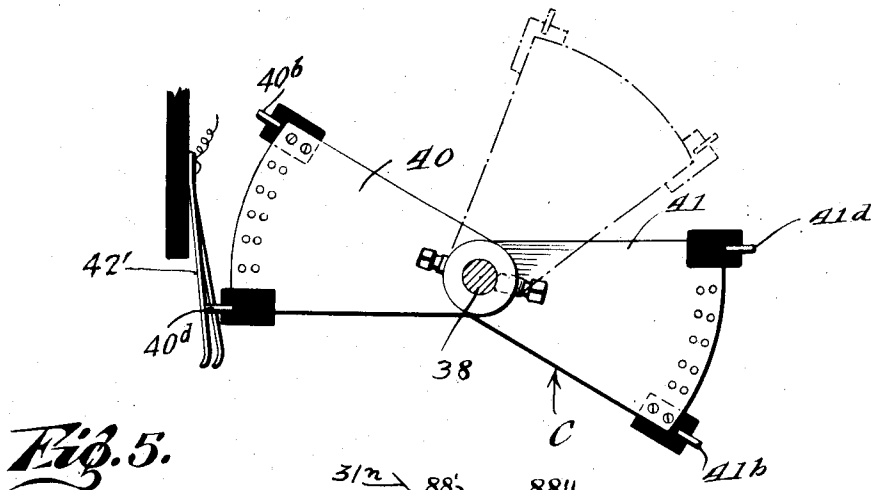
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

ALEXANDER J. MASSEY, OF LOS ANGELES, CALIFORNIA

TRAFFIC SIGNALING SYSTEM

Application filed June 25, 1923. Serial No. 647,666.

This invention relates to signaling systems and more particularly to a drive for traffic signaling systems for city streets and the like. The major organization in which I use this invention has for its object to provide a group of or a plurality of groups of signals located at different street intersections and improved economical time-controlled central means of control therefor whereby all of such signals may be controlled as to their traffic signaling action. Furthermore, by the employment of certain features of said organization in connection with properly organized signals, the control of the signals with respect to the extinguishing of the same or movement thereof to non-signaling position at the proper time for suspension of traffic rules may be automatically accomplished.

In another application for Letters Patent filed by me July 2, 1921, Serial No. 482,137, (Patent No. 1,640,845, issued Aug. 30, 1927) for traffic signals, I have shown and described a signal, and a signaling system embodying a group of such signals and an automatic central time-controlled means for controlling the setting of the signals to indicate when traffic is to proceed, indicated by the display of a face marked "Go", the setting of the signals to indicate when traffic is to stop, indicated by the display of a face marked "Stop", and for controlling the signals to cause the extinguishing, or removal from view, of the signal faces when the traffic rules are suspended. The signals disclosed in said patent are admirably adapted for incorporation in a system embodying the present invention, but it should be noted that features distinct from said drive are claimed in my applications S. N. 487,520 and S. N. 487,521, filed October 9, 1930.

Means may be provided at the controlling central station which provide automatically for an entire week of traffic control, with any variations from the regular daily routine which may be required, as for instance, for Saturday night traffic control, and suspension of activity and consequent obscuration or retirement from view of both the "Stop" and "Go" signal faces during the

entire day on Sunday; and such weekly program of traffic control may be automatically carried out continuously week after week, all in accordance with the predetermined adjustment of controlling means elements.

With the above and other objects in view, an organization including the invention may comprise the novel and useful provision, formation, combination, association and relative arrangement of parts, members and features, all as hereinafter described, shown in the drawings, and finally pointed out in claims.

In the drawings:

Figure 1 is a side elevation, with parts broken away or omitted, of a central controlling means unit constructed and organized to embody the invention, and adapted for the continuous automatic control of a large number of traffic signals located at street intersections;

Figure 2 is a fragmentary plan view of the controlling means unit shown in Figure 1;

Figure 3 is an enlarged fragmentary detail plan view of a portion of the showing in Figures 1 and 2, the actuating motors of the unit and mechanism for alternately employing the motors, each in substitution for the other during certain time periods being illustrated in this figure;

Figure 4 is a fragmentary horizontal transverse sectional view of parts of the controlling means unit, the view being taken on the line X4—X4, Figure 2, and looking in the direction of the appended arrows;

Figure 5 is a fragmentary horizontal transverse view of impulse controlling parts taken on the line X5—X5, Figure 2, and looking in the direction of the appended arrows this view being not simultaneous with Figs. 1 and 2, and being used to show optional features of modification;

Figure 6 is a sectional detail view taken on the line 6—6, Figure 2, and looking in the direction of the appended arrows;

Fig. 7 is a partial wiring diagram.

Referring with particularity to the drawings, in the form of controlling means unit shown in Figures 1, 2, 3, 4, 5, and 6, A design-

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nates a suitable supporting framework, B designates time-controlled motor means for operating the unit, C designates impulse controlling means, D designates actuating means for the impulse controlling means C, E designates time-controlled governing means for the actuating means D, F designates diurnal control means, G designates weekly control means, and H designates means for periodically alternately employing separate motor elements of the time-controlled motor means.

The framework A is shown as comprising vertical members 15, and horizontal members 16 suitably arranged to support the various rotating and other parts of the unit.

The time-controlled motor means B is shown as comprising two constant speed electro-motors 17 and 18 mounted upon the framework A and adapted to be periodically employed each in substitution for or relief of the other, subject to control by the means H. The motors 17 and 18 are shown as having their armatures coaxially arranged; and a shaft 19 having a worm 20 fixed thereto is mounted for rotation between the motor armatures and in position to be driven by either a clutch member 17' carried by the shaft of the armature of the motor 17 or by a clutch member 18' carried by the shaft of the armature of the motor 18, clutch members 21 and 22 being carried by the worm shaft 19 in position to be engaged by the members 17' and 18', respectively, when the latter are longitudinally shifted into contact therewith. A solenoid 17^a having an armature 17^b is fixed upon the motor 17 and a solenoid 18^a having an armature 18^b is fixed upon the motor 18; the armatures 17^b and 18^b are connected by a rod 22' having depending clutch-shifting fingers 17^c and 18^c respectively taking into annular grooves 21^a and 22^a in the mentioned slidable clutch members. By alternately energizing the solenoids 17^a and 18^a, the motors 17 and 18 will thus be alternately connected with the worm shaft to drive the same.

Means of operative connection between the motor means B and the means E, the diurnal control means F, the weekly control means G, and the means H, may comprise a gear train or gear trains organized to give the required reduction in gear ratios between the worm shaft 19 and such means E, F, G and H, so that the relative rate of motion of these parts is assured. As shown in the drawings, a relatively large gear 23 fixed to a shaft 23' rotatably mounted in the framework has its teeth in mesh with the worm 20 and is driven thereby; a relatively small spur pinion 24 is likewise fixed to the shaft 23' and meshes with a spur gear 25 fixed to a shaft 25' rotatably mounted in the framework below the shaft 23'. This shaft 25' carries a worm 26 which

meshes with a gear 27 fixed to a rotatably mounted shaft 27' which ranges longitudinally of the framework A and carries a worm 27'' arranged to take into the teeth of a gear 28. This gear 28 is fixed to a rotatably mounted transverse shaft 28' which has a contact disc 29, comprised within the means H, fixed thereto at its inner end and a worm 30 fixed thereto at its outer end. A considerable reduction in the rate of rotation of the contact disc 29, as compared with the rate of speed of the driving motor 17 or 18 is thus obtained. As such contact disc 29 controls the shifting of the clutches 21 and 22, as will be hereinafter described, the shifting of the work of driving the mechanism of the unit from one motor to the other is controlled thereby and the time period between each such change of motors is dependent upon the rate of speed of disc rotation.

A further reduction in the rate of speed of rotation of a contact drum 31 comprised within the diurnal control means F, to cause the same to make exactly one complete revolution in every twenty-four hours, may be had by providing a rotating shaft 32 at right angles to the shaft 28' and having a gear 32' fixed thereto in mesh with the worm 30 and a worm 33 fixed thereto in mesh with a large gear 33' which is secured to the transverse shaft 34; the transverse shaft 34 is rotatably journaled in the framework A and has the contact drum 31 secured thereto.

A rotatable transverse shaft 35 mounted in the framework A above the shaft 23' has a bevel gear 35' secured thereto at one end and is driven by a bevel gear 36 secured to the upper end of a vertical rotatable shaft 36'. At its lower end the shaft 36' has a bevel gear 36^a secured thereto, and such gear 36^a is in mesh with a bevel gear 37 secured to the end of the shaft 25'. A pinion 35^a secured to the shaft 35 drives the time-controlled governing means E.

The impulse controlling means C, by means of which electrical contacts are made to cause controlling impulses to be sent to each street signal, or each group of street signals, as the case may be, is shown as comprising a longitudinally ranging shaft 38 rotatably journaled in the framework, as at 38'', and having a large gear 39 secured thereto, an adjustable contact device consisting of the parts 40 and 41 secured thereto, and a plurality of spring contact fingers 42 and 42'. The contact devices are shown as plurally provided, in separate sets, upon the same shaft, to illustrate how different signal actuations may be caused, with respect to different signals or signals of different groups, each such contact device controlling the impulses sent to a different signal or a different group of signals. The

part 40 is shown as a sector having a hub 40' bored to receive the shaft 38 and having a threaded aperture to receive a set-screw 40'' by means of which the sector is secured to the shaft 38. At its outer margin and at one edge thereof the sector carries an insulating block 40^a upon which is mounted a metallic switch blade 40^b such block and its blade being disposed at one side of the relatively thin sector body. At the opposite side and opposite edge of the sector, and at the outer margin thereof, an insulating block 40^c carrying a switch blade 40^d is provided. In the instance shown in Fig. 5, the switch blade 40^d projects from the sector body in a direction opposite that of the blade 40^b. The part 41 may be formed similarly to the part 40 and comprises a sector having a bored hub 41', set screw 41'' to secure the sector to the shaft 38, and oppositely disposed switch blades 41^a and 41^b supported to project at opposite sides of the sector 41 and at opposite edges thereof by insulating blocks 41^c and 41^d, respectively. The switch blades 41^a and 41^b are of sufficient length to contact with two spring fingers 42 to close circuits one wire of which is connected to each of such fingers, and the switch blade 40^b is of just sufficient length to contact with the next adjacent pair of spring fingers 42; the switch blade 40^d, however, is a little longer than the blades 40^b, 41^a and 41^b so as to contact with a pair of the fingers 42 and in addition thereto with a special contact finger 42'. This special contact finger is connected with features of the signal starting and extinguishing means as will be hereinafter described.

The actuating means D for the impulse controlling means C is shown as an electromotor 46 fixed in the framework A and having a shaft 46^a connected with its armature shaft and provided with a worm 46^b at its outer end. The worm 46^b meshes with the large gear 39 on the shaft 38 which is periodically rotated by the motor as the same is intermittently energized or supplied with electrical energy.

The time-controlled governing means E which controls the supply of electrical energy to the motor 46 of the means D is shown as comprising a small rotatable drum 47 of insulating material fixed to a shaft 47' rotatably journaled in the framework as at 47'', a pair of spring contact fingers 48 and 48' riding on the periphery of the drum 47 and in position to be contacted with by a switch bar 47^a extending longitudinally of the drum, and a switch device *e* associated with the shaft 38. This switch device *e* is shown as comprising a longitudinally movable rock shaft 49 parallel to the shaft 38, rock shaft actuating means *e'* for longitudinally moving the rock-shaft (and comprising a solenoid 50 having an armature form-

ing an extension of the rock-shaft), a switch bar 51 on the rock-shaft, a fixed contact 51^a adapted to be engaged by a contact on the switch bar, a spring 52 for holding the switch bar in circuit closing position, and means (shown as comprising a pair of diametrically opposed switch bar engaging fingers 53 fixed on the shaft 38) for moving the switch bar to open circuit position. The switch bar 51 is shown as having a bored hub by means of which it is fixed to the rock-shaft 49 and an extension or arm 51' terminating in a hook extending normally into the path of rotation of the diametrically opposed fingers 53 which terminate in hooks matching the hooked terminus of the switch bar extension 51'. The switch bar 51 is shown in Fig. 4 as carrying an insulated switch point 51^b adapted to contact with the fixed switch point or contact 51^a. One wire of the corresponding circuit terminates at each switch point. The rock-shaft 49 is arranged to rotate and slide in the framework at one of its ends, as at 49', and the armature at its other end is arranged to rotate and slide in the solenoid. A spring 54 normally holds the rock-shaft with its switch bar in the vertical plane of the fixed switch point. The drum 47 is driven by an idler gear 55 which meshes with the pinion 35^a and a gear 55' fixed to the rotatable drum shaft 47'. The drum 47 controls the energization of the solenoid 50, the switch bar 47^a of the drum 47 closing the solenoid circuit at each revolution.

Upon each energization of the solenoid 50 its core draws the rockshaft toward the solenoid and moves the hooked switch controlling arms of the rock shaft out of the plane of the switch bar 51 allowing the spring 52 to draw the switch bar upwardly and contact with the fixed point 51^a, so closing the circuit of, and energizing the motor 46, which is permitted to turn the shaft 38 through one-half revolution only, the circuit of the solenoid 50 having been meanwhile broken and the rockshaft moved by the spring 54 to again bring the hooked fingers or arms 53 into the plane of the switch bar 51,—the hooked extension of which is caught by a hooked arm 53 and moved to break the circuit of the motor 46. The latter must remain mechanically and electrically inactive until the drum 47 again closes the circuit of the solenoid 50 to draw the hooked arms 53 out of the plane of the switch bar 51, whereupon the motor 46 is again energized to give the shaft 38 another half-turn. During time-periods between successive actuations or half-revolutions of the shaft 38 the signal faces remain set or in their positions of display, the sectors 40 and 41 being usually so arranged on the shaft 38 that the spring finger contacts are between them (out of contact) during the

pauses in shaft rotation. It will thus be seen that the rate of rotation of the drum 47 controls or determines, to a certain extent, the length of time, or time-period of display, without change, of a signal face. By adjusting the sectors 40 and 41 so that they will not be exactly diametrically opposed, but by moving them in a circular path about the axis of the shaft 38, and fixing them in any such predetermined position, a shorter time-period of display of one signal face than another may be had; the total cycle period (or time-period of display of a "Stop" face plus display of a "Go" face) will, however, be the same time-period as is required for two complete rotations of the drum 47.

The diurnal control means F is shown as the rotatably mounted drum 31, and a plurality of sets of switch points or spring fingers 31', 31'', 31''' and 31''', engaging the same and in position to have circuits closed therethrough by circuit closing or switch bars 31^b mounted at the periphery of the drum 31, one such bar being provided for each set of fingers. These switch bars 31^b may be entered into undercut channels 31^c cut longitudinally in the surface of the drum 31 the bars 31^b being of such cross-section that they will project above the surface of the drum proper, which is preferably formed of suitable insulating material. By forming the channels 31^c close together in the drum, I am enabled to vary the arrangement of the contact or switch bars 31^b to meet almost every possible requirement, with respect to time of extinguishing separate signals or separate groups thereof each night, and causing the reappearance thereof in signalling action each morning, certain signals or groups thereof at one time, and other signals or other groups thereof at other times. The contact fingers are separately mounted on a block 31^d of insulating material. The contact bars 31^b of each set lie in different zones of the drum, and are spaced about the axis of the drum. As the series of bars controlling the signal extinguishing action are successively advanced to the contact zone each day, the corresponding or connected signals will be extinguished.

A long contact bar 31^{b'} extending through all the zones of the drum in which the shorter bars 31^b lie may be placed in one of the channels 31^c behind all of the bars 31^b so as to make contact with all of the spring fingers 31', 31'', 31''' and 31'''' at a time later than the time of contact of the shorter bars with their respective sets of fingers. This provides for the extinguishing of all of the signals or groups thereof simultaneously and at a later hour than they would successively be extinguished by the action of the shorter bars, special

provision being also made to prevent the action of the shorter bars becoming effective on such days as it is desired to run the signals until a late hour, as for instance, Saturdays, and such action may be dependent upon feature of the weekly control means G.

Long contact bars such as are shown at 31^{b'} may be provided in suitable channels 31^{c'}, lying in such portions of the so-called drum as will be advanced to the contact zone of the mentioned spring fingers at suitable hours each evening and/or morning. However, if desired, whether I use a single long bar (as shown) or a plurality of such bars, they may be cut into or formed from a series of shorter bars, one for each set of the contact fingers, and such bars may be arranged to be presented to each set of fingers in sequence so to start various signals or groups at different times.

One end of the drum 31 is shown as provided with a circumferential cam 56 which may be located between the evening signal extinguishing bars and morning signal starting means, so as to come into play in switch opening action after the last of the controlled signal faces has been extinguished for the night. A pivoted switch bar 57 has a cam-follower or roller 57' which rides upon the cam 56 during the night or non-signaling hours and keeps the circuit controlled thereby open by drawing the switch bar out of contact with or otherwise separating the switch points 57^a and 57^b which are in circuit with the spring contact fingers 48 and 48' of the governing means E. The drum 47 thereof being during the period of circuit interruption in an open circuit, fails to cause the energization of the solenoid 50,—so keeping the switch bar 51 in open circuit position and preventing energization of the motor 46 and consequent rotation of shaft 38. This prevents all signaling action during the time-period the cam requires to pass beneath its follower.

The weekly control means G is shown as a double cam 58 formed at one side of a spur gear 59 which is rotatably mounted upon a stud or axle 60 projecting from the framework A. An idler gear 59' connects the gear 59 with a pinion 59'' on the shaft 34 which carries the drum 31; the gear ratio is such that while the drum 31 makes seven revolutions the gear 59 and its cam 58 make only one revolution. The periphery of the cam 58 in one zone is so formed that a cam follower 58' (comprising a switch lever pivoted to the framework A, as at 58'', intermediately of its ends) causes a switch 60ⁿ at one end of the lever to be opened, and so open certain electrical circuits as the cam follower 58' is urged by a spring 58''' into a depression in the cam face. This depres-

sion is, for instance, presented to the follower on Saturday night, and it may be of sufficient extent along the cam surface to keep such circuits open during the entire day on the following Sunday. Upon the cam follower being forced outwardly some time during Sunday night, the circuits will be closed, and the daily or diurnal control drum 31 will cause energizing impulses to be again sent to all of the signals on the following morning, so releasing the signal faces from the non-visible position in which they were held during the period of traffic regulation suspension.

The circuit in which the switch 60_n is located is the circuit leading from the switch controlled by the cam 56 on the diurnal drum 31 to the drum 47 of the means E and the solenoid 50 controlled thereby. By this arrangement all signal activity may be prevented on Sundays as well as during the night hours.

In another plane the double cam 58 is provided with a cam face 58^a or periphery formed with a depression which requires only a few hours to pass under a cam follower 58^b pivoted to the framework and carrying a switch blade 58^c which normally contacts with two switch points 58^d and 58^e. These points 58^d and 58^e are in the circuit controlling the extinguishing of signal faces. By this arrangement, I am enabled on Saturday nights to automatically interrupt such circuit before any of the contact bars 31^b arrive at their point of contact with the spring fingers at the drum 31 and again close such circuit after such contact but before the long signal extinguishing bar 31^{b'} makes contact with such spring fingers. Thus I prevent the signals from ceasing, on Saturday nights, their operation at the usual daily hour and depend on the long bar 31^{b'} to extinguish all signal faces controlled thereby at a late hour.

Upon the framework A a switch panel *a* is shown. An adjustable or manually operable switch blade 60^x is pivotally mounted on the panel *a* and a plurality of contact points 60^a, 60^b, 60^c and 60^d are arranged in an arc on the panel *a* and in position to be selectively engaged by the blade 60. Three other such switch devices are provided on the panel *a*, and the four such switch devices shown are connected up as follows:

Each one of the contact points 60^a is connected by a circuit wire 60^{a'} to one of the contact fingers 31^{'''} of the diurnal control means F, each one of the contacts 60^b is connected by a circuit wire 60^{b'} to one of the contact fingers 31^{''}, each one of the contacts 60^c is connected by a circuit wire 60^{c'} with one of the fingers 31['], and each one of the contacts 60^d is connected by a circuit wire 60^{d'} to one of the fingers 31[']. The outer end of each switch blade 60^x may be indirectly

and conditionally connected to spring fingers 42' of the separate sets of fingers 42, 42', comprised within the impulse means C and with "extinguishing" circuits of the respective signals, as hereinafter described.

The contact disc 29 of the means H is shown in Figure 7 as provided with a broad arcuate contact strip 29' extending through slightly more than 180 degrees on the face of the disc and about the axis thereof, and with a contact or switch blade 29'' located inwardly of the arcuate strip and on the face of the disc. A pair of spaced contacts 29^a, and a pair of spaced contacts 29^b, are held in the framework A at diametrically opposite points on the disc 29 and in position to be swept over by the arcuate strip 29'. A pair of spaced contacts 29^c, and a pair of diametrically opposite contacts 29^d are supported by the framework in position to be engaged by the switch blade 29''. A pair of diametrically opposite contacts 29^d to one terminal of the motor 17 and a circuit wire 29^{b'} leads from one contact 29^b to one terminal of the motor 18; a circuit wire 29^{c'} leads from one contact 29^c to one terminal of the winding of the solenoid 17^a and a circuit wire 29^{d'} leads from one contact 29^d to one terminal of the solenoid 18^a. The remaining contacts 29^a, 29^b, 29^c and 29^d are all connected with one wire 29^e of an electrical energy supply. The other terminals of the motor 17, motor 18, solenoid 17^a, and solenoid 18^a, are all connected to the other wire 29^f of the source of electrical energy supply. As the disc 29 rotates, the arcuate strip 29' closes and opens the circuits of the motors 17 and 18 alternately, the extent of the strip insuring that the idle motor will be brought up to normal speed before the circuit of the working motor is broken. When a motor has been started and has attained the proper speed of rotation, the contact blade 29'' closes the circuit of the corresponding solenoid and the armature thereof reverses the clutch connections operated thereby and disengages the retiring motor after connecting the motor lately energized. At about this time the strip 29' leaves the priorly engaged fixed contacts and the circuit of the retiring motor is broken.

In order that a large number of signals or groups thereof may be caused to operate at slightly different times, or display their "Stop" and "Go" faces in time-periods or cycles of different lengths the plurality of sets of fingers 42 and 42' are provided and the means C and its operating means D may be plurally provided. A convenient arrangement is shown in Figures 1 and 2 where a tubular shaft 38' surrounds the shaft 38 and has its own operating motor 46' and suitable operating connections. Governing means E_s equivalent to governing means E may be provided in the form

of a second rotatably mounted disc 47's similar to the disc 47, but driven at a different rate of rotative speed, due to use of an idler gear of a size differing from the one driving the disc 47. A solenoid, switch device, and other features corresponding to the control or governing features of the motor 46 and shaft 38 are provided in association with the shaft 38' and the motor 46', analogous parts of Es being identified in Fig. 6 by similar characters each with an added "s". Two of the adjustable sector devices are shown on each of the shafts 38 and 38', one such device coacting with each set of fingers 42 and 42' and so providing for the differential control of the signal faces of four different groups of signals, due to the different time intervals between the contacting of the sector switch blades with their respective contact fingers 42, as the sectors 40 and 41 of each sector device may be differently adjusted on their shafts with respect to each other.

On Saturday evenings, if desired, the functioning of the bars 31^b in signal face extinguishing action may be prevented, as when the switch blade 58^c is moved to open position by the cam follower, due to the formation of the cam periphery, the circuit through the short bars 31^b is broken, and not again closed until the last of the bars 31^b has passed through the contact zone. After the last of the bars 31^b has passed the contact zone, the formation of the Saturday evening cam will permit the switch blade 58^c to again close the circuit, and an impulse will be sent to all of the signals connected with the switches 60^x and so cause the retirement of all signal faces so controlled.

In order to prevent signal operation during the day on Sundays, and to cut off, the supply of energy to the means C during the night hours, the circuit wire 87 which has its terminals connected one with each of the supply wires 85 and 85' is interrupted by the Sunday switch 60ⁿ and the switch 57 which is opened nightly by the cam 56. The drum 47 of the means E is in this circuit and as such drum 47 controls the energization of the solenoid 50 which is also in this circuit, the solenoid is in an open circuit during the night hours and on Sundays.

The motor 46, switch bar 51 and fixed contact point 51^a are in the same circuit which comprises the wire 46^a, the terminals of which wire are connected, one to each of the supply wires 85 and 85'.

In case all signals are to be simultaneously started, the morning or signal starting circuit wires 81 of all of the groups of signals may be joined or connected together and the common terminal thereof connected to a brush 88 which normally projects into the space in the annular contact 86^a on the end of the drum 31. An adjustable radial

contact 88^a has its one end 88' bored (see Fig. 6) to receive an insulating bushing on the drum shaft and has its other end 88'' in constant electrical contact with the annular contact 86^b. At the proper hour for starting the signals the contact 88^a passes under the brush 88 and so connects the wires 81 momentarily with the feed wire 80, causing the release of the signal faces from their fixed position.

Each "East and West" signal face controlling wires leads to the corresponding set of fingers 42 where it is connected with one of such fingers 42 lying next adjacent to one of the fingers 43 connected to the feed wire 80. Each "North and South" signal face control wire leads to the remaining finger 42 of the corresponding set of fingers.

The governing means E, during the periods of its activity, which periods are determined by the periods during which the night switch and Sunday switch are closed, causes the motor 46 to be intermittently energized, and the shaft 38 turns through 180 degrees at each such energization. This movement of the shaft 38 causes the four contact fingers 42 of the set to be swept over or contacted with by the switch blades carried by one of the sectors. Such contacting with the fingers 42 closes the circuit momentarily, first through the "East and West" signal face movement controlling magnets 46, and then through the "North and South" signal face controlling magnets 46. When the drum 47 of the governing means E again causes the energization of the motor 40, and the shaft is again turned through 180 degrees, the switch blades on the other sector, one of which may be the long switch blade, another impulse is sent through each set of magnets 46. An impulse will also be sent through the contact finger 42' upon the contacting of the long switch blade therewith, and when other control features are properly connected up, as determined by the time of the day, such impulse will be sent through starting magnets or switching magnets, which may be of a type shown in one of my mentioned cases.

The spacing apart of the switch blades at each edge of a segment 40 or 41 permits of the sending of a signal-face changing impulse to one signal-face slightly in advance of another; the sending of a signal-face changing impulse to the same group of signals provides for the changing of a signal-face controlling one traffic stream from "Go" to "Stop" position slightly in advance of the changing of a signal-face controlling a traffic stream crossing the first from "Stop" to "Go" position, when such companion signal-faces at an intersection are to have their indications reversed. This permits of clearing the intersection while both such angularly related signal faces

momentarily read "Stop," and then signaling persons in the second traffic stream to proceed by exhibiting to them the "Go" face of a signal.

Having thus disclosed my invention, I claim and desire to secure by Letters Patent:

1. In combination, a pair of motors, a common load for the motors, and means for alternately connecting the motors to the load, including a circuit controller, separate from the load, and means for imparting motion thereto from the motors.

2. In combination, a pair of motors, a common load for the motors, and means for alternately connecting the motors to the load, including a circuit controller, separate from the load, a clutch mechanism arranged to connect either motor to the load, and means controlled by the circuit controller for operating the mechanism.

3. In combination, a pair of motors, a common load for the motors, means whereby said load may be connected alternately to either of said motors, a circuit controller connected to the load for periodically energizing and deenergizing the motors in alternation, but with an overlap in order to permit the energized motor to come up to speed, said controller also serving to control the means for alternately connecting the load to the motors.

4. The combination as set forth in claim 2, in which the circuit controller also serves alternately to energize and deenergize the motors.

5. In combination, a load, and means for continuously and uninterruptedly driving said load, including a pair of motors, means for connecting said motors alternately to the load, and means actuated by either motor when active to drive the load, for controlling said connecting means to cause said controlling means to render the other motor active.

In testimony whereof, I have signed my name to this specification.

ALEXANDER J. MASSEY.