

Aug. 7, 1934.

C. H. BISSELL

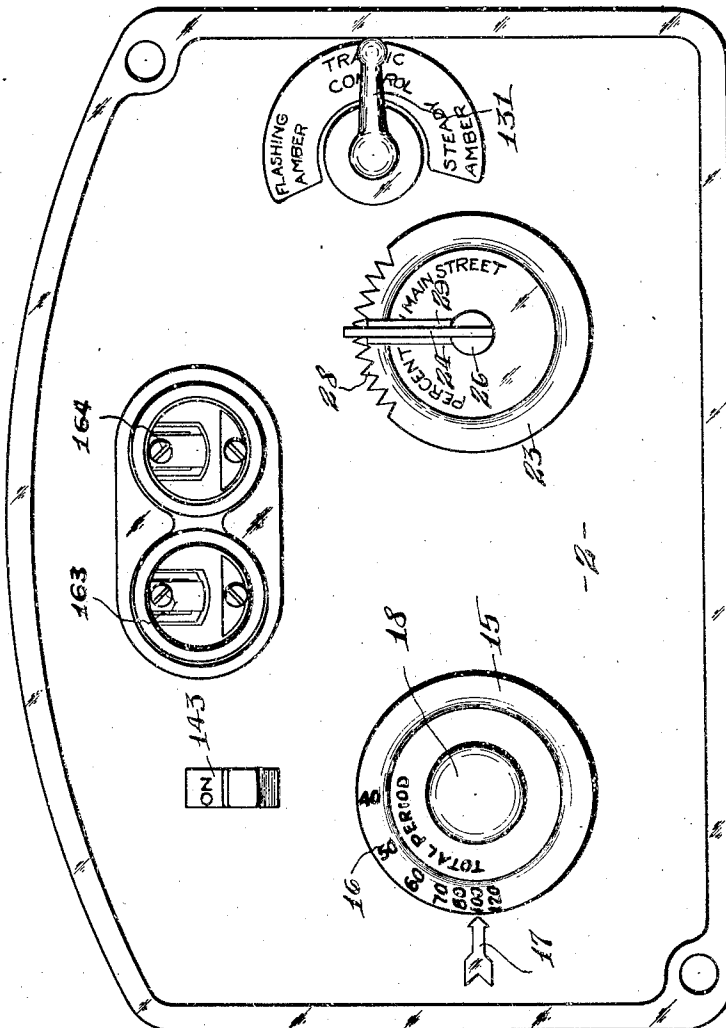
1,969,293

AUTOMATIC TIMING SWITCH FOR TRAFFIC SIGNALS

Filed April 18, 1928

4 Sheets-Sheet 1

Fig. 1.



INVENTOR.  
*Carl H. Bissell*  
BY *Parsons & Rodell*  
ATTORNEYS.

Aug. 7, 1934.

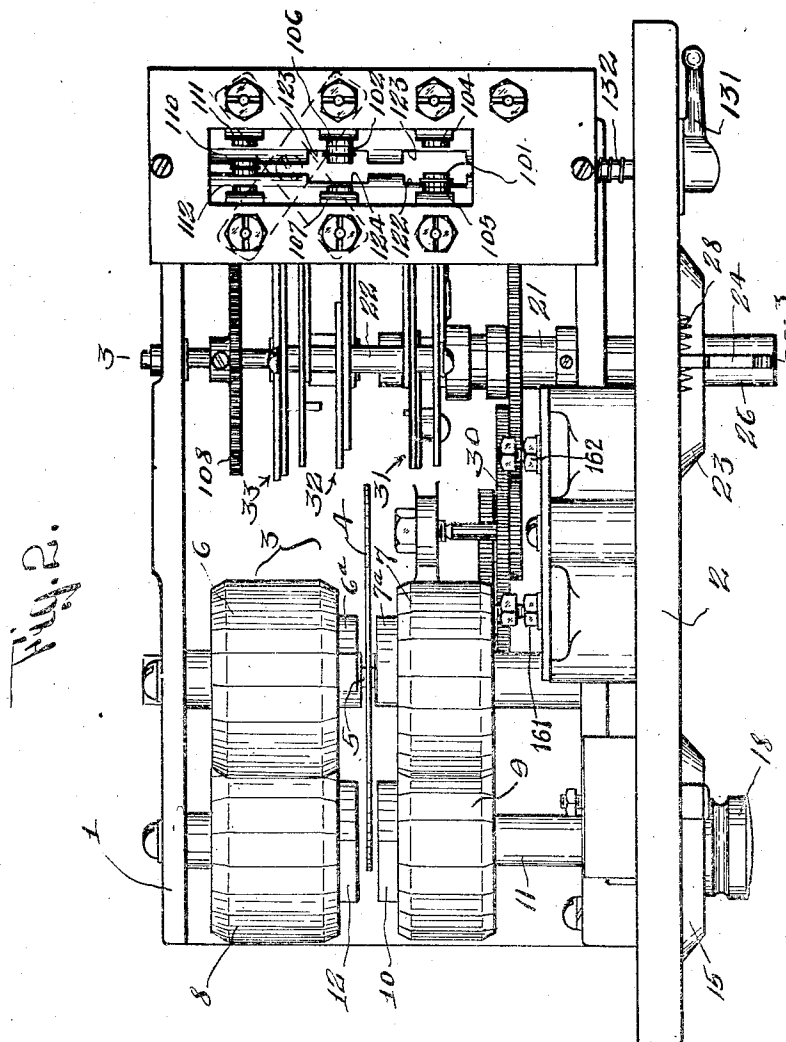
C. H. BISSELL

1,969,293

AUTOMATIC TIMING SWITCH FOR TRAFFIC SIGNALS

Filed April 18, 1928

4 Sheets-Sheet 2



INVENTOR.

Carl H. Bissell  
BY  
Parsons & Rodell  
ATTORNEYS.

Aug. 7, 1934.

C. H. BISSELL

1,969,293

AUTOMATIC TIMING SWITCH FOR TRAFFIC SIGNALS

Filed April 18, 1928

4 Sheets-Sheet 3

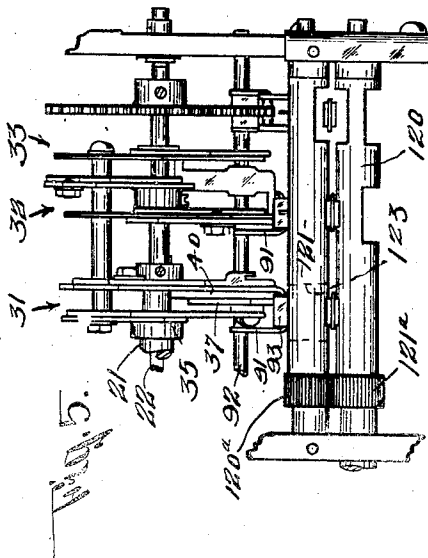


Fig. 4.

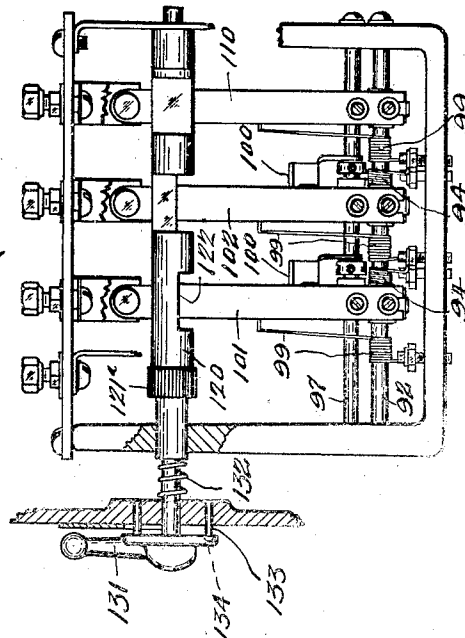


Fig. 3.

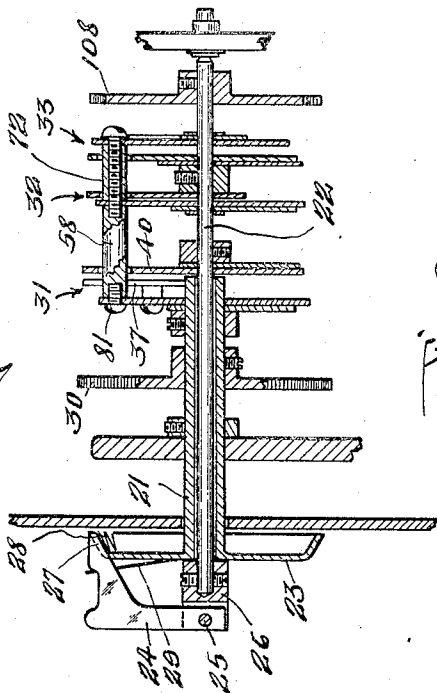
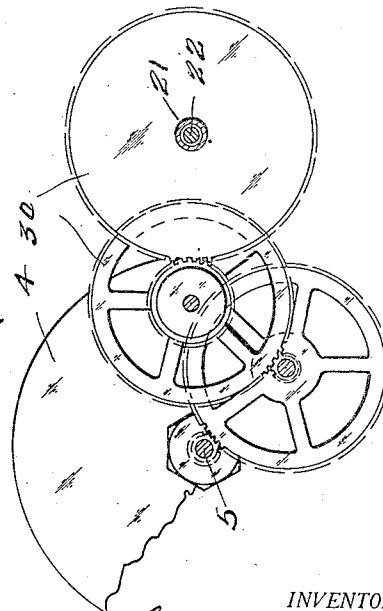


Fig. 6.



INVENTOR.

BY *Carl H. Bissell*  
*Saunders & Bissell*  
ATTORNEYS.



## UNITED STATES PATENT OFFICE

1,969,293

## AUTOMATIC TIMING SWITCH FOR TRAFFIC SIGNALS

Carl H. Bissell, Syracuse, N. Y., assignor to  
Crouse-Hinds Company, Syracuse, N. Y., a corporation of New York

Application April 18, 1928, Serial No. 270,845

8 Claims. (Cl. 200—27)

This invention relates to automatic timing switches particularly applicable for operating and timing street traffic signals in which "go" signals as green lights are displayed along one street, while "stop" signals as red lights are displayed on the intersecting street either with or without a third signal as an amber light to give warning that the signal is to change.

The invention consists in a timing switch which is particularly simple and compact in construction and highly efficient and durable in use and also, simple and readily operated and mechanism for varying the total time of the traffic cycle and the fractional divisions thereof.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a front elevation of this automatic timing switch.

Figure 2 is a plan view thereof.

Figure 3 is a fragmentary sectional view taken on the plane of line 3—3, Figure 2.

Figure 4 is an end view looking to the left in Figure 2, parts being omitted.

Figure 5 is a plan view, parts being omitted, of parts seen in Figure 4.

Figure 6 is a diagrammatic view illustrating the train of gearing between the motor and the cam shaft.

Figure 7 is an elevation of the driving cam sections for controlling the red and green or stop and go signals.

Figure 8 is an edge view of the cam shown in Figure 7.

Figure 9 is a side elevation of the driven cam section of the cam shown in Figures 7 and 8, that is, the section which is mounted on the driven cam shaft.

Figure 10 is an edge view of the parts seen in Figure 9.

Figures 11 and 12 are face views of sections of the cam for controlling the intermediate amber light displayed along one street.

Figures 13 and 14 are edge views of parts in Figures 11 and 12.

Figures 15 and 16 are respectively a face view and edge elevation of another section of the compound cam for controlling the intermediate amber light displayed on the intersecting street.

Figure 17 is a detail view partly in section showing the coaction of the cams with the contact

arms controlling one of the signal circuits, this being illustrative in general of the coaction between the cams and the contact arm which control the red and green signals and the intermediate amber signal and illustrative particularly of the coaction of the cam which controls the intermediate amber signal and its coacting contact arm.

Figure 18 is a view similar to Figure 17 illustrating the operation of the contact arm for controlling and flashing amber signals.

Figure 19 is a diagrammatic view of the wiring of this switch.

This timing switch comprises in its entirety, a suitable support, a motor mounted on the support, drive and driven cam shafts mounted on the support, timing cams comprising sections rotatable respectively with the cam shafts, the shafts normally rotating as a unit and one having an adjustable rotating movement relatively to the other to adjust the cam sections thereon relatively to the cam sections on the other shaft and thereby varying the timing of the cams and the signals, switch contact arms controlled by the cams into and out of contact or engagement with terminals connected in the signal circuits, means comprising a manual mounted on the face plate of the support for regulating the speed of the motor and thereby regulating the total time of the traffic cycle, means including a manual mounted on the face plate for adjusting the cam shafts relatively to each other to regulate the fractional divisions of the traffic cycle and motion transmitting means between the motor and the drive cam shaft.

By traffic cycle is meant, the entire time, usually computed in seconds, that is required to complete the cycle of operation of the signal. That is, assuming that the green go signals are displayed on the north and south street while the red stop signals are displayed on the intersecting street for a given number of seconds and then the signals change so that the red is displayed north and south and the green east and west, the total amount of time required to display both the red and green signals on any one street is the time of the traffic cycle. Assuming that the green and red signals are displayed 60 seconds in each direction, the traffic cycle is 120 seconds, and assuming that the green signals are displayed on the main street for 70 seconds, then the green signals will be displayed 50 seconds on the intersecting street, with a traffic cycle of 120 seconds. There is usually more traffic on a main street than on a cross street and hence, it is oftentimes

desirable to display the go signals on the main street longer than on the cross street.

By fractional division of the traffic cycle is meant, the part of the total period that the go signals are displayed on the main street while the stop signals are displayed on the cross street and vice versa. These divisions may be equal or unequal, their total always being equal to a predetermined traffic cycle less the time the intermediate warning or amber signal is displayed.

1 designates the support or frame which may be of any suitable form, size and construction and 2 is the face plate on one side thereof, the support and the face plate being arranged to be placed in a suitable box or container in which the face plate closes the open side of the box.

3 designates generally the motor, that here shown being of the induction disk type.

4 designates the disk of the motor which is mounted upon a suitable shaft 5 supported in suitable bearings in the frame.

6 and 7; 8 and 9 designate the coils of the induction motor, one of these coils and its core being shiftable to carry it and particularly the shading coils on the pole of the core more or less out of effective relation to the disk 4 in order to govern the speed of the motor.

As here shown, the coil 9 with its shading coil 10 is mounted upon a rotatable shaft 11, the shading coil 10 being segmental of a disk so that upon rotation of the shaft 11, the angle of the inducted force relatively to the disk is varied and hence, the speed of the motor varied.

12 is the shading coil of the coil 8.

6<sup>a</sup> and 7<sup>a</sup> are the shading coils of the magnets 6, 7, these shading coils being stationary.

When the coils 10 and 12 are directly opposite each other or directly in alinement, the magnetic effect is greatest and when they are out of alinement, the speed is more or less. By turning the shading coil 10 out of alinement with the shading coil 12, the direction of this induced force on the disk is composed of two components acting at different angles and hence, the speed of the motor varied in accordance with the angle of the component forces.

For lower speeds, say for a traffic cycle of 120 seconds, these coils are farthest out of alinement and for a traffic cycle of short duration as 40 seconds, they are more nearly in alinement.

The shaft 11 extends through the face plate 2 where it is provided with a dial 15 having graduations 16 thereon indicating different traffic cycles, these graduations being brought during the turning of the shaft into alinement with a single graduation 17 on the face plate. The dial is provided with a suitable knob or handle 18.

Insofar as this invention is concerned, turning of the knob 18 regulates the speed of the motor to different traffic cycles.

21 and 22 designate drive and driven cam shafts, these being arranged in axial alinement and suitably supported in the frame or support 1. As here shown, one of these shafts as the drive shaft or sleeve 21 is tubular and the other or driven shaft 22 is rotatably mounted concentric in the drive shaft 21 and extends beyond the ends thereof. These shafts normally rotate as a unit and one has an adjusting movement in a rotative direction relatively to the other to adjust the cam sections to be presently described.

The shafts 21 and 22 are normally coupled together by a suitable adjustable clutching device located in front of the face plate so as to be readily operable.

The clutching device here shown comprises a member as a head 23 on the front end of the tubular shaft 21 and overlying the face plate and a shiftable member as an arm 24 pivoted at 25 to a collar 26 on the front end of the shaft 22, the arm 24 having a tooth 27 coacting with notches 28 in the head 23. The arm 24 is normally held in the notches by a spring 29 pressing against the same.

The spring here shown is a flat spring with its one end held between the collar 26 and the abutting surface of the head 23 and its other end pressing against the toothed end of the arm 24, the spring being slotted so that the toothed end 27 extends therethrough, see Figures 1 and 3.

The clutch member or head 23 is provided with a suitable scale indicating the position of the cams and expressed in terms of the percentage that the go signals are displayed on the main street. Assuming that the traffic cycle is 120 seconds and it is desired to display the go and stop signals equally on both the main and cross streets, the arm 24 is set with its tooth 27 in the notch opposite the 50% graduation. If it is desired to display the go signals on the main street a third longer than on a cross street, the arm 24 is moved about its axis and thereby rotating the shaft 22 relatively to the shaft 21 and the tooth 27 located in the notch 28 opposite the 60% graduation on the head 23.

A suitable train of gearing designated generally 30, Figure 6 is interposed between the motor shaft 5 and the driving cam shaft 21, this train of gearing being supported by the frame in any suitable manner.

The cams operated by the cam shafts 21 and 22 in the illustrated embodiment of my invention are three cams 31, 32, 33 on the cam shafts 21 and 22. The cam 31 controls the displaying of the stop and go signals on the main street and the intersecting street and the cams 32 and 33 control the intermediate amber acting as a unit, but the parts thereof are subject to adjustment so that the intermediate amber signal may be increased or decreased.

Each cam comprises sections rotatable respectively with the cam shafts 21 and 22 and the section on the shaft 22 being mounted to be shifted relatively to the section rotatable with the shaft 21 when the shaft 22 is turned relatively to the shaft 21 by the handle 24. One section of the cam 31 is mounted directly on the shaft 21 and the sections of the cams 32, 33 which rotate with the shaft 21 are mounted on the shaft 22 but capable of rotation about the same and are connected together and to the section on the shaft 21 by a yoke. The other sections which rotate with the shaft 22 are keyed to the shaft 22. The cam 31 which controls the displaying of the stop and go signals, that is, the red and green lamps will now be described.

Each cam coacts with two followers and each section is composed of two sections coacting respectively with the followers. Each section comprises segments initially adjustable with each other to time the cams so that the green or go signals will not appear while the amber signals are being displayed, or so that the amber will overlap either or both green or red signals. Two followers are used to give a snap action to the operation of the signals and are designated 91 and 96, Figure 17.

The section of the cam 31 mounted on the shaft 21 comprises a disk 34, Figure 7, having a hub 35 mounted on the inner end of the tubular

shaft 21 and keyed thereto as by a screw 36, the disk having a lobe 37 offset therefrom and also a second lobe 38 diametrically opposite the former lobe but located in the plane of the disk 35 and not offset out of such plane.

The section of the cam 31 which is rotatable with the cam shaft 22 comprises a disk 40, Figures 9 and 10, having a hub 41 mounted on the shaft 22 and keyed thereto as by a screw 42, the disk 40 lying against the offset lobe 37 of the disk 34. The disk 40 is provided with a high or lobe portion 43, the periphery of which is flush with the edge of the lobe 37. The disk 40 is provided with an arc shaped slot 44 therein through which the yoke to be presently described extends, this slot permitting relative adjusting movement of the disk 40 relatively to the disk 34 when the shaft 22 is turned relatively to the shaft 21 by means of the adjusting arm 24. To cause the green and red signals to appear when the amber disappears and to disappear when the amber appears, the disk 34 is provided with an adjustable segment 45 secured thereto by a screw 46 extending through a slot 47 in the disk 34. Also, the disk 40 is provided with an adjustable segment 48 on the side thereof for the same reason secured thereto by a screw 49 extending through a slot 50 into the disk 40, this segment having also a slot 50<sup>a</sup> in line with the slot 44 to clear the yoke when necessary by the adjustment of the cam by turning the shaft 22.

The lobes 38 and 45 of the cam section 34 on the drive shaft 21 coact with the companion follower 96, while the lobe 37 of the disk 34 and the lobe 43 of the disk 40 coact with the follower 91.

The cam 32 comprises a section as a disk 51, Figures 11 and 13, rotatable with the shaft 21 or the disk 34 and a segmental disk 52 mounted thereon and adjustable relatively thereto and held in its adjusted position by a screw 53 extending through an arc shaped slot 54 and threading into the disk 51.

The disk 51 is formed with a high or lobe portion 55, see Figure 11, and the segmental disk 52 is formed with a lobe portion 56 having a point 57, the edge of the lobe 56 being flush with the edge of the lobe 55. These disks 51 and 52 are initially adjustable varying the period the intermediate amber light is exposed by varying the extent of the high and valley portions of the cam. The disk 51 is connected to the disk 34 by a yoke or pin 58, see Figure 3, so that it rotates with the driving cam shaft 21. This section of the cam 32 which is rotatable with the driving cam shaft 21 coacts with the companion follower 96.

The section of the cam 32 rotatable with the cam shaft 22 comprises a segment 77, Figure 12. The segment 77 has a hub 63 on the shaft 22 and keyed thereto as by a set screw 64. This segment, Figures 12 and 14, is rotatable with the shaft 22, it being shown in Figures 12 and 14 as mounted on the hub 63 of the section 61 of the cam 32, which hub is keyed to the shaft 22. The segment 77 is formed with an arc shaped slot 78 through which the yoke 72 extends. The segment 77 is similar to the segment 62 of the cam 32 and is arranged oppositely thereto with the slot 78 in line with the slot 68 of the segment 62.

The segment 77 coacts with the companion follower 96 to control as to extent of time and synchronism of the intermediate amber light preceding the red on one street and preceding the green on the intersecting street. The segments 71, 61 and 62 to be described of the cam 33 control

the intermediate amber light preceding the green on the first street and the red on the intersecting street and coact with the follower 91.

Segments 61 and 62 of cam 33, Figures 12 and 14, are adjustable to lap each other different distances and are held in their adjusted position by a screw 65 extending through a slot 66 in the segment 61 and threading in a hole in the other section. Both segments 61 and 62 are also formed with arc shaped slots 67 and 68 arranged in alignment through which a yoke to be presently described, extends, the slot 68 being a continuation of the slot 66 but of greater width than the same.

The cam 33, Figures 15 and 16, comprises a segment 71 rotatable with the shaft 21 and connected thereto by a yoke 72, Figure 3, a section 73 mounted on the hub 74 thereof and adjustable about the same and having an arc shaped slot 75 therein for receiving a fastening screw 76.

The cams 32 and 33 are in practical effect one cam or a double cam as they control the timing of the intermediate amber light indicating that the signal is to change and the double cam 32, 33 is used in order to adjust the timing of the amber lights. For instance, one of these cams may be adjusted to throw on the amber light preceding the green signal longer than the amber light preceding the red signal on the same street, or vice versa. For instance, assuming the go signal is displayed on the north and south streets, and the red signal on the east and west streets, the amber light may be displayed thereafter three seconds before the red light goes on the north and south streets and the green light goes on the east and west streets, while the amber light following this period may be displayed for five seconds before the signal changes from green east and west and to red north and south to green north and south and red east and west. The adjustments of the segments 45, 57 is for this purpose.

The sections 51 and 52 of the cam 32 are adjustable to vary the time that the amber light is on, this being dependent upon the amount that the sections 51, 52 or the lobe portions thereof overlap and this adjustment is accomplished by shifting one section relatively to the other after loosening the screw 53 and then again tightening the screw.

Likewise, the sections 61, 62 of the cam 33 are adjustable for the same purpose by first loosening the screw 65 shifting the sections 61, 62 to adjust the amount of overlap thereof and again tightening the screw 65. Also, the sections 71 and 73 of the cam 33 are adjustable to have more or less overlap by first loosening the screw 76 and shifting the section and then again tightening the screw to move follower 91 at proper instant.

The yoke 58 is a rod secured by a screw 81 extending through a hole 82 in the section 34 of the cam 31 and threading into the end of the rod, the rod extending through the slot 44 in the section 40 of the cam 31, which section 40 is rotatable with the driven cam shaft 22. The end of the rod 58 abuts against the face of the section 51 of the cam 32 in line with a hole 83 therein; and the yoke 72 consists of a spacing sleeve between this disk or section 51 of the cam 32 and the section 71 of the cam 33, the yoke 72 further including a screw extending through a hole 84 in the disk 71 through the sleeve through the hole 83 and threading into the end of the yoke 58. The yoke or sleeve 72 extends through the slots 67, 68 and 78 in the sections 61, 62 and 77.

The adjustments of the several sections for the timing of the amber light are made initially and intended to be permanent although they can be changed. The traffic cycle may however be readily changed by regulating the speed of the motor, and the dividing up of the traffic cycle into fractional periods is accomplished by turning the shaft 22 relatively to the shaft 21 and hence, shifting the sections of the cams rotatable with the cam shaft 22 relatively to those sections rotatable with the driving cam shaft 21.

Each of these cams coacts with cam followers 91, 96 illustrated in Figure 17. The follower 91 is shown as a lever pivotally mounted on a shaft 97 mounted in the frame and having a wiper 93 coacting with the companion cam section 37, 40, 61, 62, 71 or 73 and associated parts rotatable with the cam shaft 21. This lever is pressed against its cam by one arm of a coiled spring 94 coiled about the shaft 92, there being one spring for each follower. The spring is similar to the spring 94<sup>a</sup>, Figure 18. The companion follower 96 is pivotally mounted on the shaft 97 carried by the frame and has a wiper 98 coacting with the companion cam, the follower 96 being pressed against its cam by an arm of a spring 99 coiled about the shaft 92. The spring 94 is stronger than the spring 99. Each of the follower levers 91 is provided with a shoulder 100, Figure 4, extending into the path of the companion follower arm 96. The actions of these two spring arms 91 and 96 give a snap action to the followers to close one circuit and open another suddenly and the spring 94 being stronger actuates the follower 91, and hence the follower 96 and contact arm 101 or 102 against the spring 99 acting on the follower 96 when the follower 91 moves off the lobe or high portion of the cam; or when the follower 91 moves off the lobe of the cam, the stronger spring 94 reacts and in actuating the follower 91 causes the shoulder 100 thereof to thrust against the follower 96 and force it away from the cam.

The followers 91, 96 thus have a sort of escapement action. The follower 91 moves the follower 96 to carry the contact arm 101 or 102 into engagement with the terminal 104 or 106 by reason of the shoulder 100 engaging said follower 96. Follower 91 is moved by cams so that the shoulder 100 is out of contact with the follower 96 thus allowing the follower 96 to snap when low point of the cam passes thus bringing arms 101 or 102 into contact with the terminals 105 or 107. The spring 99 is tensioned by the outward movement of the follower 96.

Each of these followers 96 actuates a switch or contact arm 101 or 102 carried by the base or block of insulation 103 which is carried by the follower arm 96 so that this contact arm 101 or 102 rocks about the shaft 97. Each contact arm is connected in the electric circuit and coacts with opposing spaced apart contacts 104, 105 or 106, 107 which are connected in circuit with the signals. There is also an additional cam 108 Figure 18 on the shaft 22, this being in the form of a star wheel and coacting with a spring pressed follower 109 mounted to rock about the shaft 97 and carrying a contact arm 110 movable between two opposing terminals 111, 112. The contact arm 101 is actuated by the cam 31 and the contact arm 102 by the cams 32, 33 and the contact arms 110 by the cam 108.

The cam 31 controls the green and red signals. The double cam 32, 33 controls the intermediate

amber light and the cam 108 a flashing display of the amber light when the green and red signals are out of use.

Means is provided for locking the flashing amber feature from movement when the signal is in regular operation, that is, locking the arm 110 from movement and for locking the arm 101 which controls the red and green signals when the flashing or the steady amber light is in use.

This locking means as here shown comprises a pair of rock shafts 120, 121 arranged on opposite sides of the contact arms 101, 102, 110 which are arranged in a row, the rock shafts having recesses or cut-outs 122 and 123 therein arranged to come into alinement when the shafts are turned in one position and form a passage for the movement of the contact arm 101 and to bring full portions adjacent the contact arm when turned in another direction to lock the arm from movement. It is also formed with similar passages 124 and 125 see Figure 17 for the contact arm 102.

The passage 125 in the rod 120 is formed angular or extends three-quarters of the way around the rod 120 in order to permit a shoulder 126 on the rod 121 to press the arm 102 against the contact 106 when steady amber is desired. The rods 120 and 121 also have similar cut-outs 127 and 128 for the follower 110. There are two cut-outs 128 arranged on opposite sides of the rod 120. When the flashing amber light is desired, the cut-out 127 and one of the cut-outs 128 come into alinement to permit a full vibrating movement of the contact arm 110 into and out of contact with the terminals 111 and 112 and during this period, full portions of the shafts are holding the contact arms 101 and 102 from movement. When a steady amber light is desired, the shafts are turned so that the cut-out 128 is in line with the contact arm 110 so that a cam pin 129 on the shaft 121 can hold the contact arm 110 against the terminal 111 at the same time the pin on the shaft 121 coacting with the contact arm 102 is holding the contact arm 102 against the terminal 106 so that all amber circuits are closed and held closed.

The shafts 120 and 121 are journaled in the frame and the shaft 121 extends through the frame and the face plate to the front side thereof where it is provided with a handle 131 movable over a suitable dial which indicates the operation desired, the dial having three indications as flashing amber, traffic control and steady amber. The shaft 121 upon which the handle 131 is mounted has a slight endwise movement against the action of a spring 132, Figures 2 and 4, which permits the handle to have a ratcheting action over ratchet pins 133 coacting with suitable depressions 134 in the hub of the handle. These ratchet pins and notches coact to have a snap action to accurately locate the handle in any one of its three positions. The shafts 120, 121 are connected together by gears 120<sup>a</sup>, 121<sup>a</sup>.

In Figure 19, a diagrammatic view of the wiring is shown and it will be understood that there are stop and go signals, that is, green and red signals and an intermediate amber signal displayed both on the main street and on the intersecting street and that when the green signals are displayed on the main street, the red signals are displayed on the cross street and when the signal is to change, from green to red or from red to green, an intermediate amber signal is displayed and that this amber signal on main and intersecting streets may be displayed for equal or unequal intervals.

In Figure 19, 140 and 141 designate the feed circuit having suitable protecting fuses 142 therein and also having a suitable switch 143, the coils 6, 8, 7, 9 of the motor being connected in the legs 144 and 145 of the feed circuit. The leg 144 of the feed circuit is connected by branch wires 146 and 147 to the contact arms 101, 102 and 110. The terminal 104 which coacts with the contact arm 101 is connected by a wire 148 in circuit with the green lights displayed on the main street and with the red lights on the cross street, while the terminal 105 is connected by a wire 149 to the red lights displayed on the main street and the green lights displayed on the cross street. The green lights and red lights are connected by return wires 150, 151 and 152, 153 to the other leg 145 of the feed circuit.

The terminals 106 and 107 which coact with the contact arm 102 to control the intermediate amber are connected by wires 154 and 155 to the amber lights displayed on the main and cross streets and these amber lights are connected by return wires 156 and 151 to the leg 145 of the feed circuit.

The terminals 111 and 112 which coact with the contact arm 110 controlling the flashing amber are connected respectively to terminals 106, and 107 and thus to wires 154 and 155 to the amber lights and these amber lights are connected by a return wire 156 and wire 151 to the leg 145 of the feed circuit. These flashing amber lamps and the intermediate amber and the steady amber are all the same lamps connected in the different amber circuits. The feed wires are connected to the instrument through terminals 161, 162 which in turn are connected to the fuse receptacles 163, 164 exposed to the face plate 2.

In operation, the speed of the motor to the desired traffic cycle is adjusted by turning the knob 18 and the traffic cycle split up into fractions of the same or different lengths by adjusting the cam shaft by turning the arm 24. In the normal operation, the handle 131 controls the red, green and intermediate amber light and the handle 131 is in the position shown in Figure 1. By turning the handle 131 until it overlies the legend, steady amber, the contact 101 is locked in an intermediate position out of contact with the terminals 104, 105 while the contact arms 102 and 110 are locked in engagement with the contacts 106 and 111. By turning the handle until it overlies the legend flashing amber, the contact arms 101 and 102 are locked in central position out of contact with the terminals 104, 105 and 106, 107 while the contact arm 110 is free to vibrate between the terminals 111 and 112.

What I claim is:

1. In an automatic timing switch, the combination of a plurality of opposing terminals, movable contact arms extending between the terminals, one for each pair, timing means for actuating the contacts, a pair of rock shafts extending on opposite sides of the contact arms and having recesses to be brought into alinement to permit movement of the contact arms and out of alinement to lock the contact arms from movement.

2. In an automatic timing switch, a pair of opposing terminals for connection in signal circuits, a contact movable automatically into engagement with said terminals, means for actuating the contact and means for controlling the actuation of the contact by the actuating means comprising a pair of rock shafts arranged on opposite sides of the contact and having recesses arranged to be brought into alinement to form passages for per-

mitting movement of the contact, the rock shafts being movable to bring full portions adjacent the contact to hold the contact from movement.

3. In an automatic timing switch, the combination of a plurality of opposing terminals, movable contact arms extending between the terminals, one for each pair, timing means for actuating the contacts, a pair of rock shafts extending on opposite sides of the contact arms and having recesses to be brought into alinement to permit movement of the contact arms and out of alinement to lock the contact arms from movement, the recesses for the contact arms being arranged in different radial positions relatively to each other whereby upon movement of the rock shafts one of the contact arms may be locked from movement and the other permitted to be actuated by the timing means.

4. In an automatic timing switch for signals, the combination of a pair of opposing fixed terminals a movable contact arm between the terminals, timing switch mechanism for moving the contact arm alternately into engagement with the terminals respectively, a pair of rock shafts extending on opposite sides of the contact arm and having recesses in their sides arranged to be brought into alinement to form a passage for the movement of the contact arm, and a manual for operating the rock shafts to bring full portions thereof into engagement with the contact arm to prevent movement thereof.

5. In an automatic timing switch for signals, the combination of a pair of terminals connected in branches of a signal circuit, a contact movable alternately into engagement with said terminals, means for actuating the contact comprising a cam, a pair of oppositely movable followers coacting with the cam, one follower being connected to the contact to actuate it, the followers being pivoted and movable on their pivots relatively to each other, and one follower having a shoulder extending into the path of the other whereby the followers are connected by a lost motion connection, a spring having arms acting oppositely on the followers respectively to press them against the cam whereby the spring is tensioned by either follower to give a snap action to the other.

6. In an automatic timing switch for signals, the combination of a pair of terminals connected in branches of a signal circuit, a contact movable alternately into engagement with the terminals, means for actuating the contact comprising a cam, a pair of oppositely movable followers coacting with the cam for moving the contact in opposite direction, the cam being shaped to actuate the followers oppositely to each other, springs acting on the followers to cause them to follow the cam, the spring of one follower being stronger than that of the other to overcome such other spring and actuate the contact against the action of the other spring.

7. In an automatic timing switch, the combination of a pair of terminals connected in branches of a signal circuit, a contact movable alternately into engagement with said terminals, means for actuating the contact comprising a cam, a follower coacting with the cam, a second follower also coacting with the cam, the followers constituting a pair of oppositely movable followers coacting with the cam, the cam being shaped to actuate the followers alternately and oppositely to each other, the first follower being connected to the contact to actuate the same and the second follower having a portion extending into

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>the path of the first follower and movable away from the first follower by the action of the cam, springs acting on the followers to hold them against the cam, the spring associated with the second follower which has the portion projecting into the path of the first follower being stronger than the spring acting on such first follower whereby when the cam permits the stronger spring to react on the second follower, said second follower moves the first follower away from the cam and actuates the contact against the weaker spring of the first follower.</p> | <p>for each pair, timing means for actuating the contacts, a pair of rock shafts extending on opposite sides of the contact arms and having recesses to be brought into alignment to permit movement of the contact arms and out of alignment to lock the contact arms from movement, said recesses being arranged in different radial positions relatively to each other, said rock shafts also having means associated with some of said recesses whereby upon movement of the rock shafts, certain of the contact arms may be locked from engagement with its terminals and other contact arms may be locked in engagement with one of their terminals.</p> |
| <p>8. In an automatic timer, the combination of a plurality of opposing terminals, movable contact arms extending between the terminals, one</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>CARL H. BISSELL. 90</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 95                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 105                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 110                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 115                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 120                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 125                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 130                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 135                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 140                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 145                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |