Feb. 4, 1930. C. H. BISSELL 1,745,975

AUTOMATIC VARIABLE TIMING SWITCH

Filed Aug. 25, 1926 5 Sheets-Sheet 1

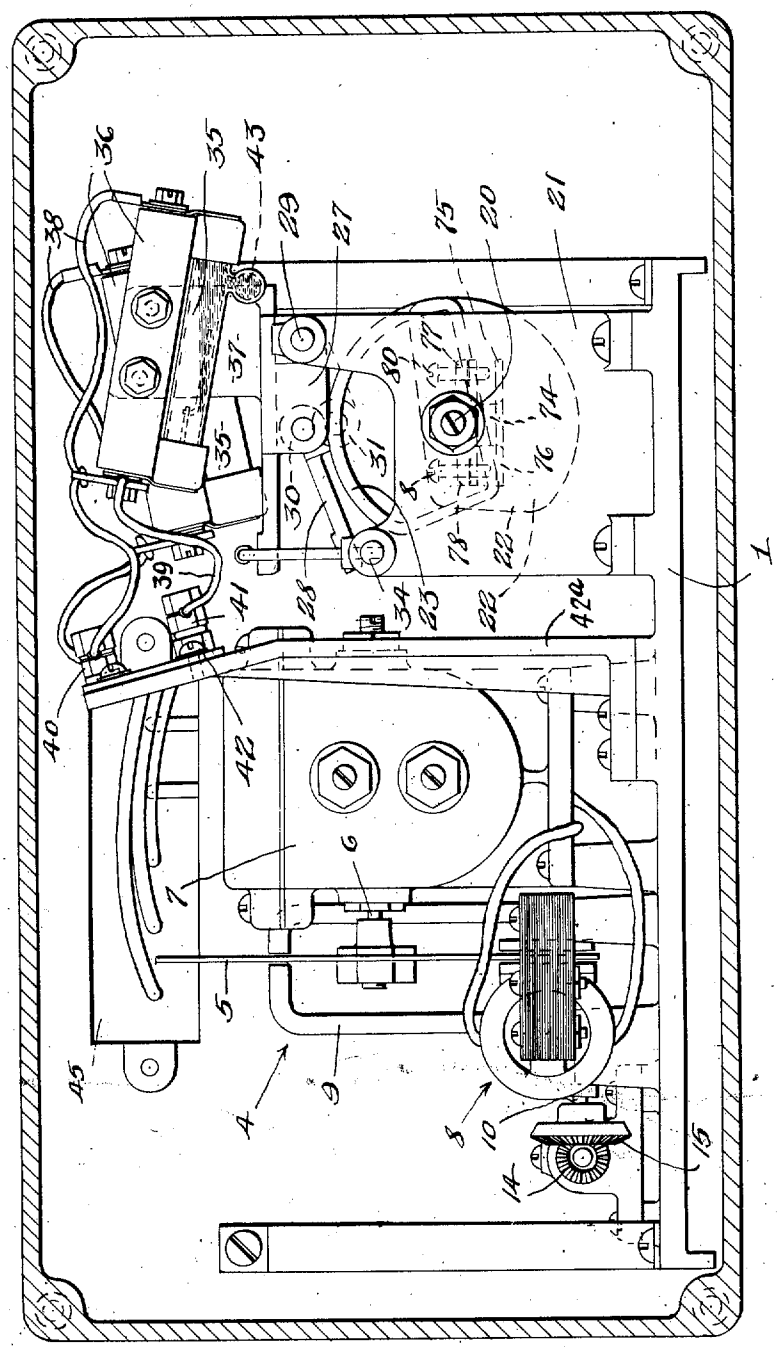


Fig. 1.

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AUTOMATIC VARIABLE TIMING SWITCH

Filed Aug. 25, 1926 5 Sheets-Sheet 2

Fig. 1.

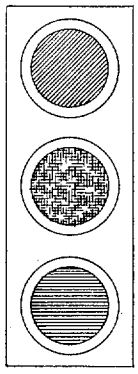
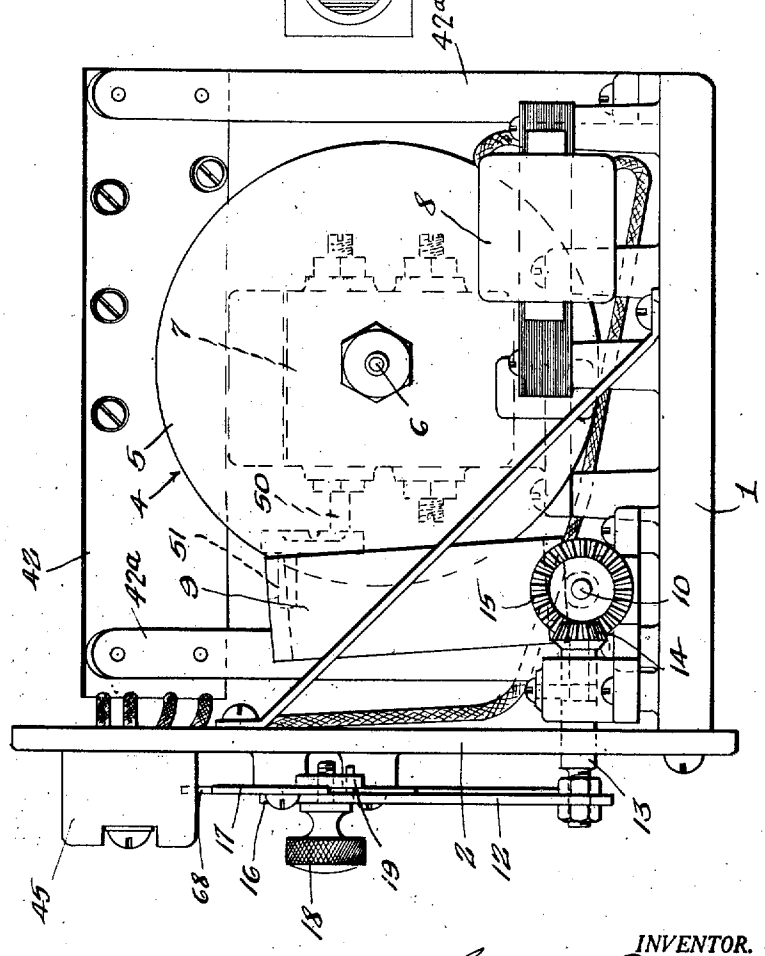


Fig. 2.



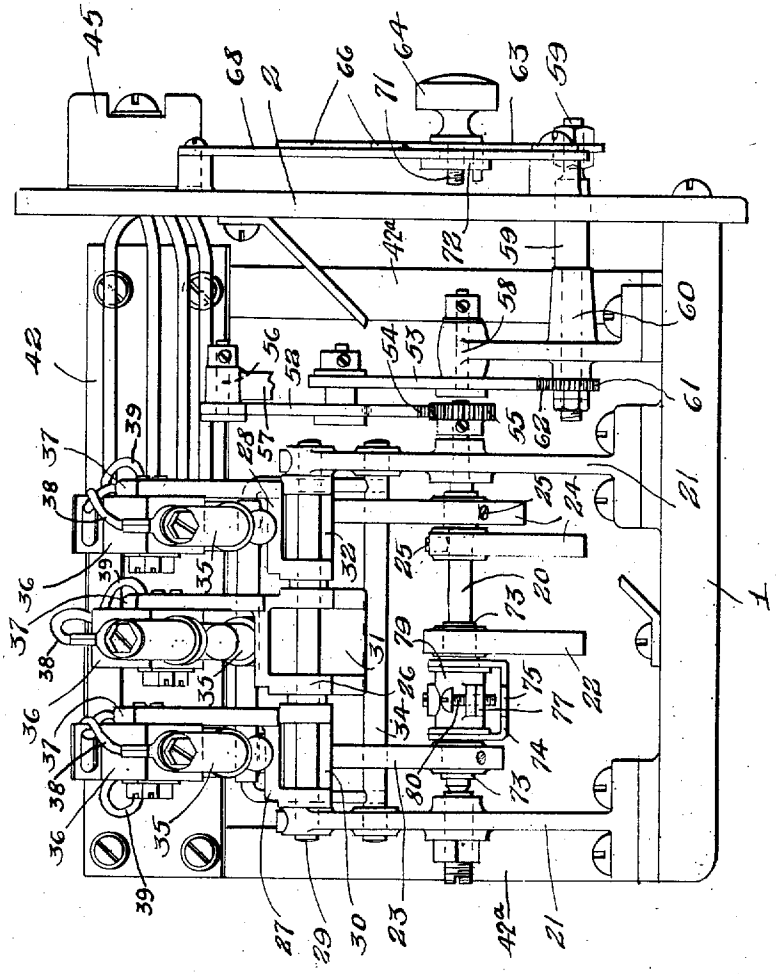
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AUTOMATIC VARIABLE TIMING SWITCH

Filed Aug. 25, 1926 5 Sheets-Sheet 3

Fig. 3.



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AUTOMATIC VARIABLE TIMING SWITCH

Filed Aug. 25, 1926 5 Sheets-Sheet 4

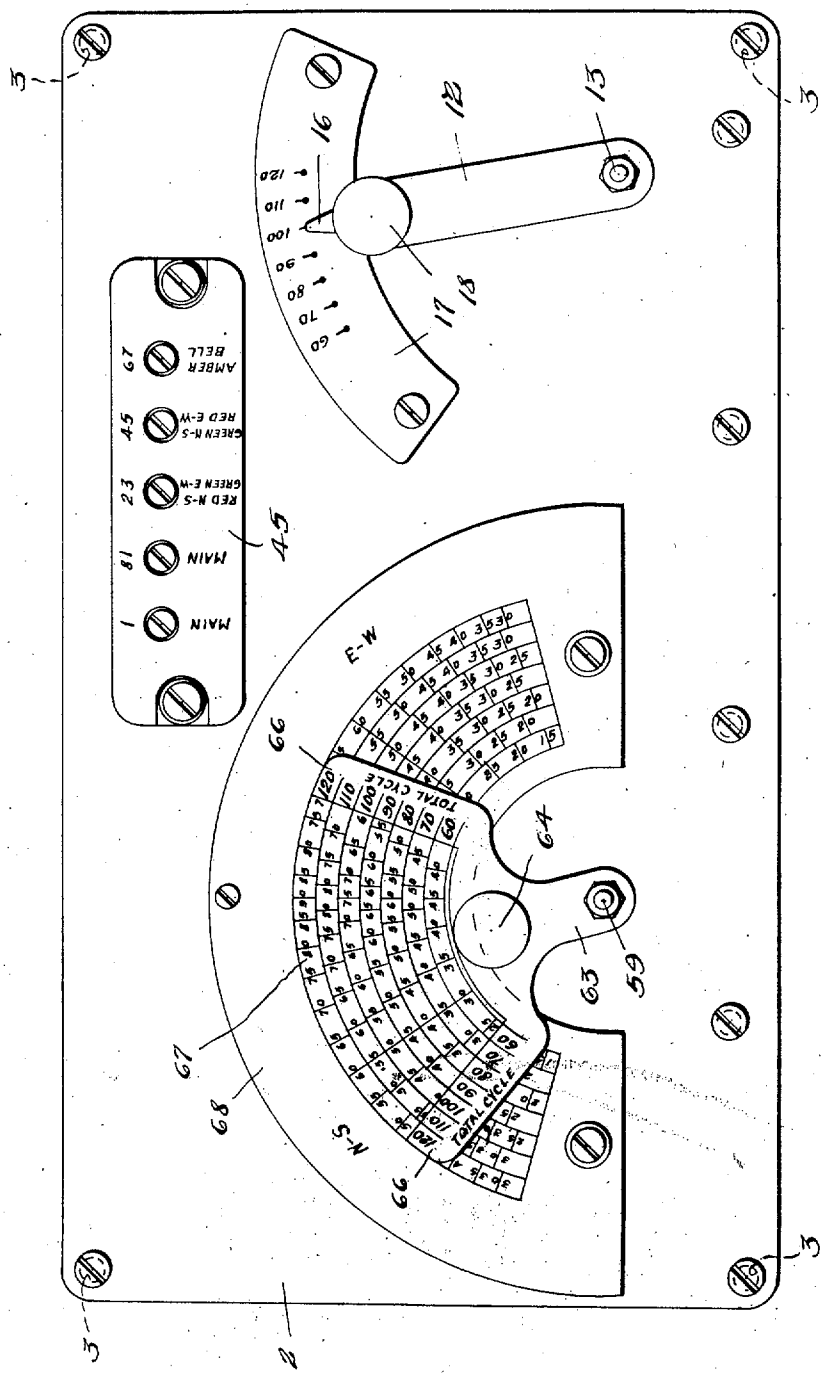


Fig. 4.

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AUTOMATIC VARIABLE TIMING SWITCH

Filed Aug. 25, 1926 5 Sheets-Sheet 5

Fig. 6.

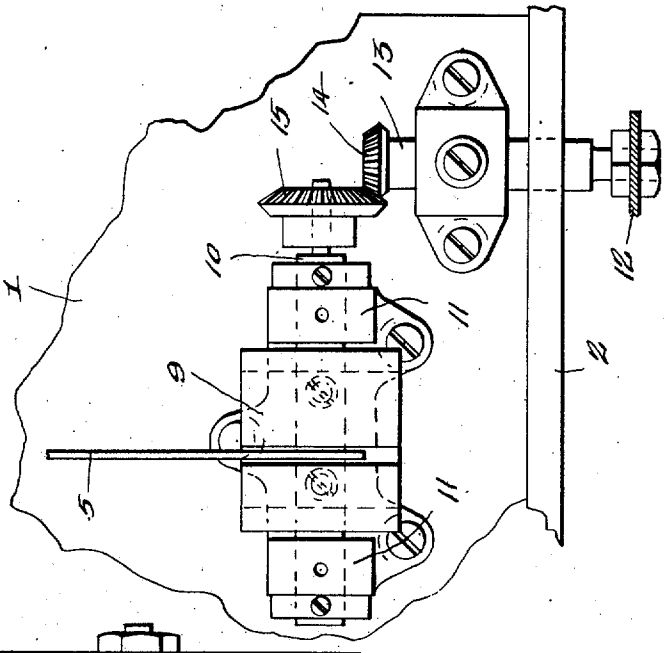
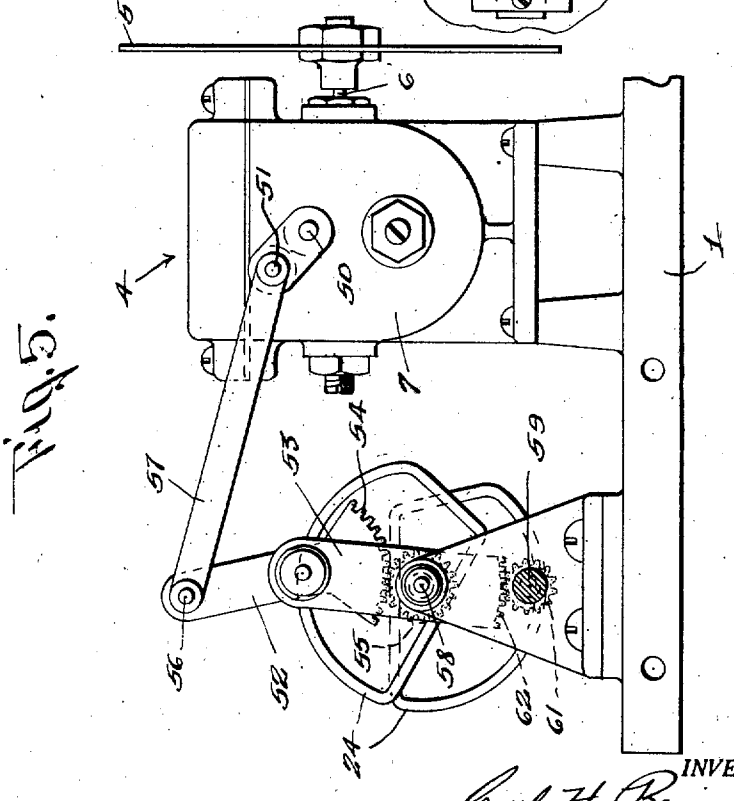


Fig. 5.



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UNITED STATES PATENT OFFICE

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AUTOMATIC VARIABLE TIMING SWITCH

Application filed August 25, 1926. Serial No. 131,470.

This invention relates to automatic timing switches for timing the operation of signals as traffic signals at street intersections and has for its object a switch unit which is particularly simple and compact in construction, readily adjustable to traffic cycles of various durations and to time the signals. Other objects will appear throughout the specification.

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 drawing in which like characters designate corresponding parts in all the views.

Figure 1 is a rear elevation of this switch unit.

Figures 2 and 3 are opposite end elevations.

Figure 4 is a view of the face plate of the switch unit.

Figure 5 is a detached view of the adjustable connection between the driving member for the switch and the driven member or shaft of the switch.

Figure 6 is a detached view of the adjusting mechanism for determining the speed of the motor or adjusting the motor to traffic cycles of various durations.

Figure 7 is a diagrammatic view of one type of signals for the operation of which this switch is designed.

This switch is particularly designed for traffic signals in which sets of signals similar to that shown in Figure 7 are presented in opposite directions on streets running north and south and in opposite directions on an intersecting east and west street, the "go" or green signals being shown north and south while the "stop" or red signals are presented east and west and the "stop" or red signals being present north and south when the "go" or green signals are presented east and west. The amber or yellow signal is presented to denote that the signal is about to change from red to green or from green to red. These amber signals are illuminated sometimes after the red and green signals are out but oftentimes, it is desired to have the amber light overlap the red and green signals or be on for a short period prior to the time that the red or the green signal is about to change. The adjustment of the switch to regulate this overlapping of the amber light with the red and green signals is one of the features of this invention.

This switch unit for timing the signals and regulating the extent of time they will be illuminated or on, comprises generally a support including a base and a face plate, a timing switch mounted on the base and including a movable member as a cam shaft and cams operated thereby and oscillating contact carrying members having followers coacting with the cam means as a motor mounted on the base and connected to the movable switch member or shaft to actuate it, connections between the motor and the switch member, means for adjusting the switch so as to vary the length of time of its intermittent operations, that is adjusting the motor to traffic cycles of various durations, that is, adjusting the speed of the motor, and means for shifting said connections relatively to the motor or driver whereby the timing of the switch is varied, both of said operating means having handles on the face plate coacting with corresponding dials on the face plate. Some of the foregoing features may however be omitted. By traffic cycle is meant the time required to have the "go" signals on a predetermined time plus the time the stop signals are on. For example, the "go" signals in one direction as north and south for sixty seconds and the "stop" signals for fifty seconds while the "go" signals east and west will be set for fifty seconds and "stop" signals for sixty seconds, the traffic cycle is one hundred and ten seconds. The time the amber light is on is not considered. It may be on about five seconds and may or may not "lap" the stop and go signals.

1 designates the base and 2 the face plate, these together with the switch mechanism being insertable in and removable from a casing or box open at one side, the face plate 2 forming the cover of the box and being secured in position by screws passing through holes 3 in the corners of the face plate.

4 designates the motor as a whole, this being of the disk type.

5 designates the disk of the motor, it being mounted upon a shaft 6 which is journalled in a suitable casing 7 suitably mounted on the base 1. The disk or the margin thereof moves between the poles of a magnet 8 as will be understood by those skilled in the art. As the construction and operation of a disk motor is well known, further description is thought to be unnecessary.

The means for adjusting the speed of the motor or adjusting it to traffic cycles of various durations is a magnetic brake for acting on the disk and means for adjusting the position of the magnet so that its field will be more or less effective on the disk.

9 designates the brake which is a permanent magnet of the general horse-shoe shape, this magnet being mounted on a rock shaft 10 journalled in suitable bearings 11 mounted on the base, the rock shaft being located outside of a vertical plane tangent to the disk so that the magnet 9 swings toward and from the axis of the disk when the shaft is rocked. The magnet when away from the disk exerts no braking effect and exerts greatest braking effect when its poles are completely on opposite sides of the disk or completely within the circle of the disk as will be understood by those skilled in the art.

The rock shaft 10 is operated by a lever 12 mounted on a rock shaft 13 extending through the face plate and having a bevel gear 14 at its inner end meshing with a bevel gear 15 on the shaft 10. This lever 12 has a pointer 16 movable over a gage or dial 17 on the face of the plate, this dial having graduations denoting the time of different traffic cycles from 60 to 120 seconds. For a 60 second cycle, the brake is adjusted to exert a minimum braking effect and for a longer cycle, the brake is adjusted to exert more braking effect in accordance with the greater cycle, a cycle of 120 requiring greatest braking effect.

The lever 12 is provided with a screw having a knob or knurled handle 18 which when tightened, clamps the lever against the dial plate 17, the shank of the screw threading into a nut or clamping member 19 behind the dial plate 17.

The cam shaft 20 of the switch itself is mounted on suitable uprights 21 on the base and has three cams 22, 23, 24 thereon, one cam 22 controlling the green lights presented north and south and the red lights on the east and west street, and the other cam 23 controlling the red lights presented north and south and the green lights on the east and west street and the third cam controlling the amber or yellow light. This third cam 24 is formed in sections adjustably mounted on the shaft 20 to regulate the extent of time the amber light is to be on. The sections of the cam 24 controlling the amber light are adjustably keyed to the shaft by set screws as 25. The cam shaft is rocked by a rotating driving shaft.

It will be obvious that by adjusting these cam sections so that their valleys or low points will be of greater or less extent will determine the time the amber lights are on as the lights are on while the follower of the mercury switch contact member to be presently described is traveling in the valley of the cam 24.

The switch contact members 26, 27 and 28 have followers coacting with the cams 22, 23, 24. These members 26, 27, 28 are pivoted at like ends on a rod 29 carried by the uprights 21 and have followers 30, 31, 32 between their ends coacting with the cam and rest at their other ends on a rod 34 carried by the uprights 21. The switch contact members 26, 27 and 28 tilt about their pivots during the rocking of the contact members by their cams. These switch contact members are oscillating mercury switches and each includes a glass tube 35 mounted in terminal pieces which are carried by a block 36 of insulation. This block of insulation is connected to the follower by an upwardly extending arm 37 on each member 26, 27 or 28. There is a contact at each end of the tube 35 and wires 38 and 39 connect the contacts respectively to binding devices 40 and 41 on a terminal support 42. During the tilting of the switch contact member, the mercury 43 in the tube makes and breaks the electrical connection between the terminals. As the operation of tilting mercury switches is well known, further description is thought to be unnecessary.

The terminal support 42 is mounted on uprights 42a rising from the base 1 between the motor and the switch. The various terminals on this terminal support are connected by suitable wires in the light or signal circuits and these wires are connected to terminals in a binding device 45 on the front of the switch so that the wires can be led to the signals from the binding device. The various wire terminals are suitably designated on the binding device.

The motion transmitting mechanism or connections between the motor and the cam shaft 20 in addition to motion transmitting mechanism within the casing 7 includes a shaft 50 extending outside of the casing 7 and having an eccentric pin as a crank pin 51 thereon, a motion transmitting part adjustably supported and connected to the cam shaft 20 and a connecting rod connecting the eccentric pin and this motion transmitting part. Means is provided for adjusting the motion transmitting part and the shaft relatively to the shaft 50 which is the driver for the driven shaft 20 so as to change the relative timing of the cam. The driving shaft rotates and the driven shaft oscillates and

hence, the timing of the cam is varied by changing the time at which the shaft reverses its motion relatively to the crank pin or changing the radial position of said part relatively to the crank pin and the connecting rod.

In the illustrated embodiment of my invention, the shiftable motion transmitting part is a lever 52 pivoted between its ends to a shiftable support 53 and having a segment 54 meshing with a pinion 55 on the shaft 20 and being connected at its other end at 56 to a connecting rod 57 which connecting rod is mounted on the crank pin 51. The support 53 is shown as a lever pivoted at 58 between its ends, and the means for shifting the support on its pivot to vary the timing of the cams is here shown as a rock shaft 59 mounted in a bearing 60 formed in one of the uprights 21 supporting the shaft 20 and having a pinion 61 at its inner end meshing with gear teeth 62 on the lower end of the support or lever 53. The shaft extends through the face plate and has a lever 63 at its outer end formed with a handle or knob 64, the lever having radial spaced apart gages or straight edges 66 movable over a dial 67 on a gage plate 68. The dial is graduated in concentric rows for currents of different cycles and each row is graduated radial and the radial graduations thereof represent different periods of time as seconds. Different street intersections require a different timing of signals. For instance, at one intersection, it might be desirable to have the green or go signals facing north and south on a longer period than the go signals on the intersecting east and west street and the stop signals complementally timed. The dial is graduated to be adjustable to any standard set of conditions. Assuming a total traffic cycle of 100 seconds, it may be desirable to have the north and south green lights illuminated 40 seconds and the east and west stop signals 60 seconds. The lever is then operated to bring the gage in line with the graduation for the number 40 on the left side of the gage plate in the 100 second circle and the reading in the same circle along the edge of the other gage indicates the number of seconds the other lamp signal will be illuminated. By adjusting the handle and reading along the proper circle, almost any combination of time periods can be found. The lever 63 is formed with a knob or handle 64 which has a screw threaded shank 71 extending below the lower edge of the circular plate and threading into a nut or clamping member 72 on the rear side of the plate.

Also, in case it is desirable to have the intermediate amber lamp signal overlap the green and red signals, the overlapping or the amount of overlapping is effected by an adjustable lost motion connection between the shaft 20 and the cams 22, 23.

In the illustrated embodiment of my invention, the cams 22, 23 are mounted on collars 73 on the shaft and are keyed to such collars and these collars are connected by a yoke 74 having arms 75, 76 extending cross wise of the shaft and the lost motion is provided between these arms 75, 76 and parallel arms 77, 78 provided on a collar 79 which is keyed to the shaft 20. Set screws 80 thread through the arms 77, 78 of the collar 79 toward the arms 75, 76. The amount of space between the ends of the set screws and the arms 75, 76 determines the amount of lost motion between the shaft 20 and the cams 22, 23 and hence determines the amount of overlap of the amber lamp on the red and green light interval as the amber light cam 24 is keyed to the shaft 20.

In operation, after the proper connections have been made to the binding device 40, the speed of the motor is adjusted or the motor adjusted to the particular traffic cycle by moving the arm or lever 20 so that its pointer 16 points to the graduation indicating the proper time on the gaging plate 17.

The extent of the timing at which the green lights are illuminated on north and south streets with respect to the red lights on the east and west streets is timed by moving the handle 64 over the plate and thus varying the time of oscillation of the shaft 20 relative to the rotation of the driving shaft 50.

What I claim is:—

1. In a timing switch of the class described, the combination of a support including a base and a face plate, a timing switch mounted on the base, a motor mounted on the base, motion transmitting connections between the motor and the timing switch to automatically operate the timing switch, said connections including members by which the timing is varied, means for adjusting the speed of the motor and means for shifting said members whereby the timing of the switch is varied, handles mounted on the base plate and connections between the handles and the motor adjusting means and the means for shifting said adjustable members respectively for transferring the motion of the handles thereto.

2. In a timing switch of the class described, the combination of a timing switch, movable means for actuating the timing switch comprising a rotatable driving member movable about an axis, an oscillating motion transmitting part, and connections between the driving member and the said part for transferring the rotary motion of the driving member to the oscillating driven part, said connections comprising manually operable means to shift the oscillating timing switch relatively to the rotary driving member by which the radial position of the oscillating part relatively to the driving member is varied.

3. In a timing switch of the class described, the combination of a support, an oscillating timing switch member, a rotatable driving member for the switch member having an eccentric pin, connections between the eccentric pin and the oscillating member comprising a connecting rod and means for adjusting the switch member about its axis relatively to the connecting rod and the eccentric pin.

4. In a timing switch of the class described, the combination of a support, an oscillating timing switch member movable about an axis, a rotatable driving member having an eccentric pin, connections between the eccentric pin and the oscillating switch member comprising a connecting rod and means for adjusting the switch member about its axis relatively to the connecting rod and the eccentric pin, said means comprising a handle fixed with respect to the movement of the switch member and the connecting rod.

5. In a timing switch of the class described, the combination of a support, an oscillating member movable about an axis, a driving member having an eccentric pin, connections between the eccentric pin, and the oscillating member comprising a connecting rod and means for adjusting the oscillating switch member about its axis relatively to the connecting rod and the eccentric pin, said means comprising a stationary support and a motion transmitting part connected to the support and means for shifting the support relatively to the connecting rod.

6. In a timing switch of the class described, an oscillating switch member movable about an axis, a rotatable actuator having an eccentric pin, an adjustable support, a motion transmitting lever pivoted to the support and connected to the switch member to transmit motion thereto and a connecting rod between the eccentric pin and said lever.

7. In a timing switch of the class described, a switch member movable about an axis, an actuator having an eccentric pin, a pivoted support, a motion transmitting member movable about an axis carried by the support and connected to the switch member to transmit motion thereto and a connecting rod between the eccentric pin and said lever and a handle connected to the support to shift it and shift the motion transmitting member about the axis of the point of connection between the connecting rod and said member.

8. In a timing switch of the class described, a switch member movable about an axis, an actuator having an eccentric pin, a shiftable support, a motion transmitting lever pivoted to the support and connected to the switch member to transmit motion thereto, a connecting rod between the eccentric pin and said lever.

9. In a timing switch of the class described, a switch member movable about an axis, an actuator having an eccentric pin, a movable support, a motion transmitting lever pivoted to the support and connected to the switch member to transmit motion thereto, a connecting rod between the eccentric pin and said lever and a means connected to the support to shift the same and hold it in its shifted position.

10. In a timing switch of the class described, a switch member, a rotatable actuator both movable about an axis, the actuator having an eccentric pin, a support comprising a support pivoted between its ends, a lever pivoted between its ends to one arm of the support and having a segment at one end, a connecting rod connecting the eccentric pin and the other end of the segment lever, the switch member having a pinion with which the segment meshes and a means connected to the pivoted support to normally hold it from movement about its axis.

11. In a timing switch of the class described, a switch member a rotatable actuator both movable about an axis, the actuator having an eccentric pin, a support comprising a lever pivoted between its ends, a lever pivoted between its ends to one arm of the support and having a segment at one end, a connecting rod connecting the eccentric pin and the other end of the segment lever, the switch member having a pinion with which the segment meshes and means connected to the pivoted support to normally hold it from movement about its axis, the supporting lever being arranged with its axis coincident with that of the switch member.

12. In a timing switch of the class described, a switch member movable about an axis, an actuator movable about an axis and having an eccentric pin, a pivoted support, a motion transmitting lever pivoted to the support and connected to the switch member to transmit motion thereto and a connecting rod between the eccentric pin and said lever, means for adjusting the support about its pivotal axis and holding it in its adjusted position, said support being arranged with its axis in parallel with the axis of the switch member.

13. The combination of driving and driven member, both movable about an axis, the driving member having a crank pin, a support pivoted between its ends on an axis coincident with that of the driven member and being adjustable about its axis, means for holding the support in its adjusted position, a motion transmitting lever pivoted between its ends to the support and connected at one end to the driven member and a connecting rod connecting the crank pin and the other end of the lever.

14. In a timing switch, the combination of a rotatable shaft having a plurality of timing cams thereon, one of the cams being keyed to the shaft to rotate therewith and the other being connected to the shaft by a lost motion

connection and means for varying the amount of the lost motion of said connection and signals operated respectively by the cams.

15. In a timing switch, the combination of a rotatable shaft having a plurality of timing cams thereon, one of the cams being keyed to the shaft to rotate therewith and the other being connected to the shaft by a lost motion connection, said connections comprising a member rotatable with the cam, and a member rotatable with the shaft, said members being spaced apart and adjustable means between the members to determine the amount of the spacing between said members and signals operated respectively by the cams.

16. In a timing switch, the combination of a rotatable shaft having a plurality of timing cams thereon, one of the cams being keyed to the shaft to rotate therewith and the other being connected to the shaft by lost motion connections, said connections comprising a member rotatable with the cam and a member rotatable with the shaft, said members having arms extending crosswise of the shaft on opposite sides thereof and the arms being spaced apart and set screws threading through the arms of one member toward the other member and signals operated respectively by the cams.

17. In a timing switch, of the class described, the combination of a support including a base and a face plate, a motor mounted on the support, a switch including a rotatable shaft and timing cams mounted on the shaft, adjustable connections between the motor and the shaft, means including a handle movable over the face plate for adusting the speed of the motor and means including a handle mounted on the face plate for adjusting the connections between the motor and the shaft, movable contact carrying switch members mounted above the shaft in position to coact with the cams thereon, a terminal support on the base between the motor and the switch, a binding device for the circuits on the face of the board, wires connecting the binding device and the terminals, and wires connecting the terminals and the contacts of the switch members and signals operated respectively by the cams.

18. A switching mechanism comprising a motor, a plurality of switches, switch operating means driven by said motor for opening and closing said switches in a predetermined desired sequence and common adjusting means included in said switch operating means for varying the time relation or operation between some of said switches and simultaneously with such adjustment varying the relative time of the operation of another of said switches to maintain the desired sequence of operation, said adjusting means comprising a handle for operating the common adjusting means and a graduated dial for indicating the adjustment affected by the handle.

19. A switching mechanism comprising a motor, three switches, switch operating means driven by said motor for opening and closing said switches in a predetermined desired sequence, one switch being opened and closed twice for each opening and closing of the other two switches and common means for adjusting the time relation between the operation of the last mentioned switches and simultaneously adjusting the time of operation of said first mentioned switch to maintain the desired sequence of operation, a handle for said common adjusting means and a graduated dial with which the handle coacts for indicating the position of the adjustment of the switches.

20. A switching mechanism comprising a frame having a face plate, a motor, a plurality of switches, switch operating means driven by the motor for opening and closing said switches in a predetermined desired sequence, all mounted on the frame and common adjusting means included in said switch operating means for varying the time relation of operation between some of said switches and simultaneously with such adjustment varying the relative time of operation of another of said switches to maintain the desired sequence of operation, the adjusting means including a handle mounted adjacent the face plate and a graduated dial coacting with the handle and mounted adjacent the face plate in juxtaposition to the handle to indicate the adjusted position of the switches.

21. A switching mechanism comprising a motor, a plurality of switches, switch operating means driven by said motor for opening and closing said switches in a predetermined desired sequence and common adjusting means included in said switch operating means for varying the time relation or operation between some of said switches and simultaneously with such adjustment varying the relative time of the operation of another of said switches to maintain the desired sequence of operation and means for indicating the adjusted position of the adjusting means.

22. A switching mechanism comprising a motor, three switches, switch operating means driven by said motor for opening and closing said switches in a predetermined desired sequence, one switch being opened and closed twice for each opening and closing of the other two switches and common means for adjusting the time relation between the operation of the last mentioned switches and simultaneously adjusting the time of operation of said first mentioned switch to maintain the desired sequence of operation and means for indicating the adjusted position of said adjusting means.

23. In a timing switch, the combination of

a rotatable cam shaft having a pair of cams therein, switches operated by the cams, one switch controlling the display of go signals on the main street and stop signals on an intersecting street and the other cam controlling the stop signals on the main street and the go signals on the intersecting street, a third cam on the cam shaft and a switch operated thereby for controlling the operation of an intermediate signal showing that the signals operated by the pair of cams are about to change, the third cam being connected to the shaft by a lost motion connection substantially as and for the purpose described.

24. In a timing switch, the combination of a rotatable cam shaft having a pair of cams therein, switches operated by the cams, one switch controlling the display of go signals on the main street and stop signals on an intersecting street and the other cam controlling the stop signals on the main street and the go signals on the intersecting street, a third cam on the cam shaft and a switch operated thereby for controlling the operation of an intermediate signal showing that the signals operated by the pair of cams are about to change, the third cam being connected to the shaft by a lost motion connection substantially as and for the purpose described, and means for varying the amount of lost motion of said connection substantially as and for the purpose described.

In testimony whereof, I have hereunto signed my name at Syracuse, in the county of Onondaga and State of New York, this 1st day of July, 1926.

CARL H. BISSELL.