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AUTOMATIC TRAFFIC LIGHT CONTROL

Filed Dec. 3, 1927

4 Sheets-Sheet 1

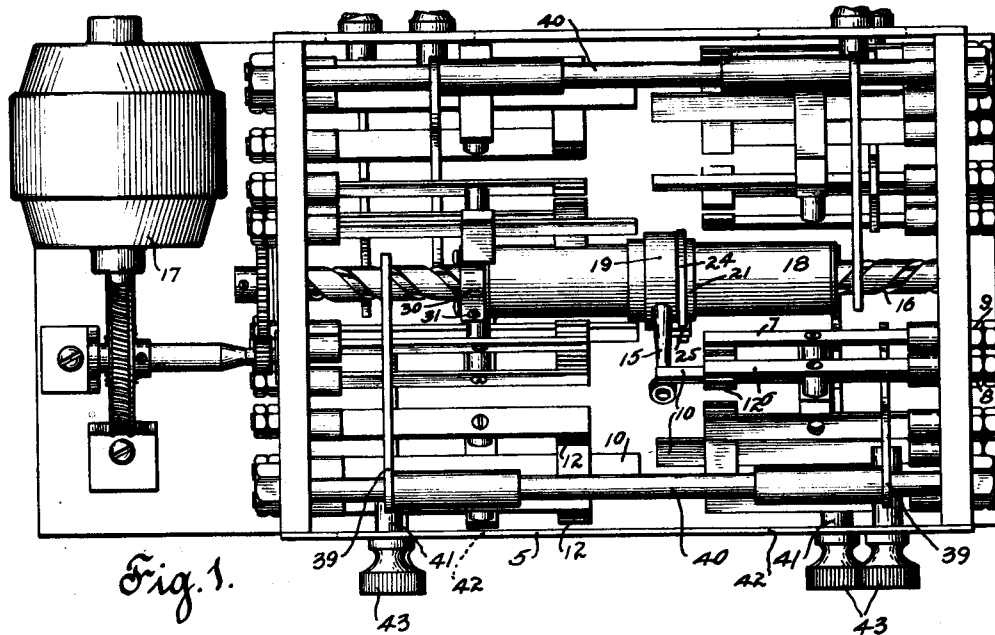


Fig. 1.

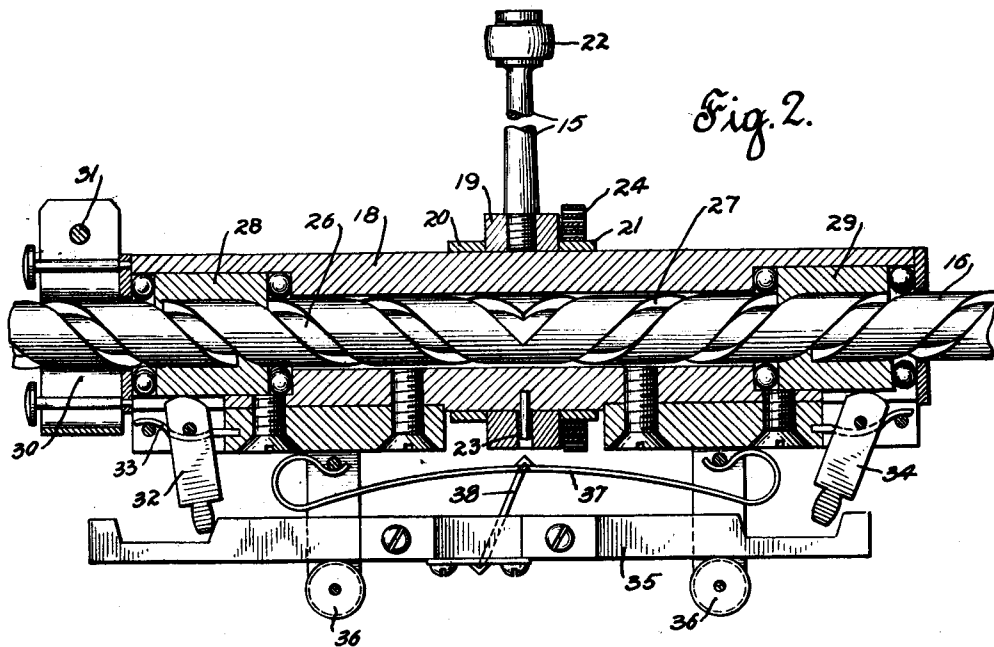


Fig. 2.

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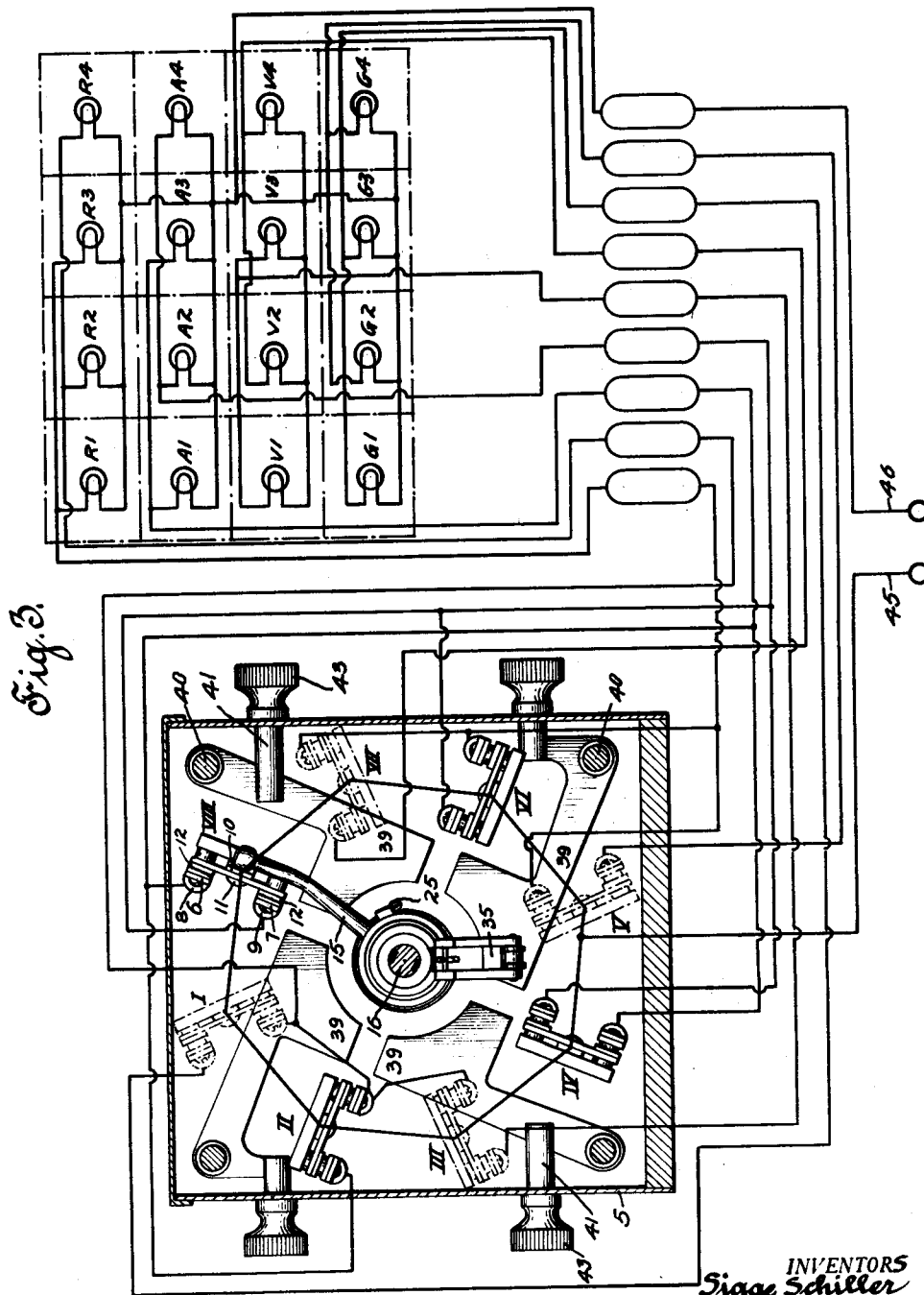
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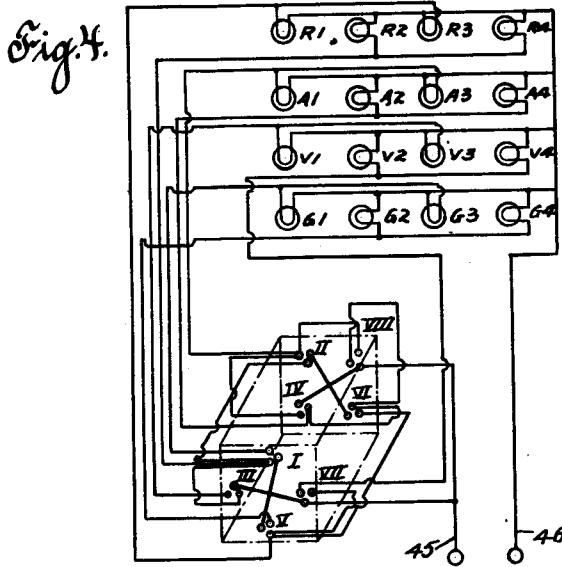
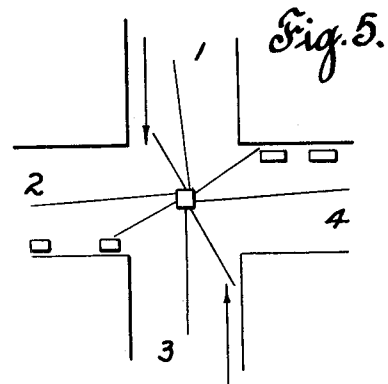
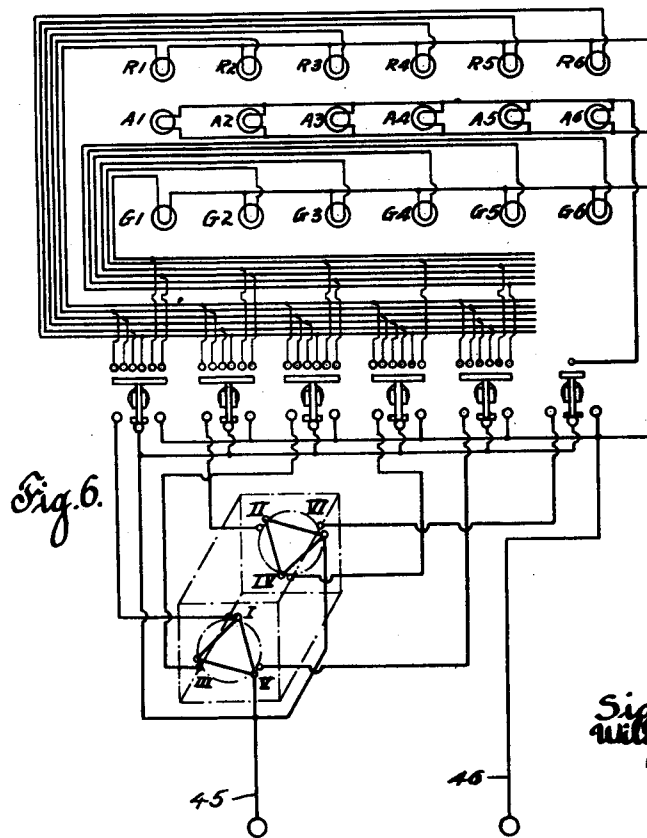
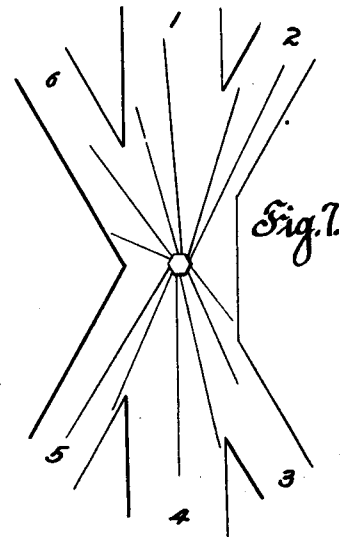
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4 Sheets-Sheet 3



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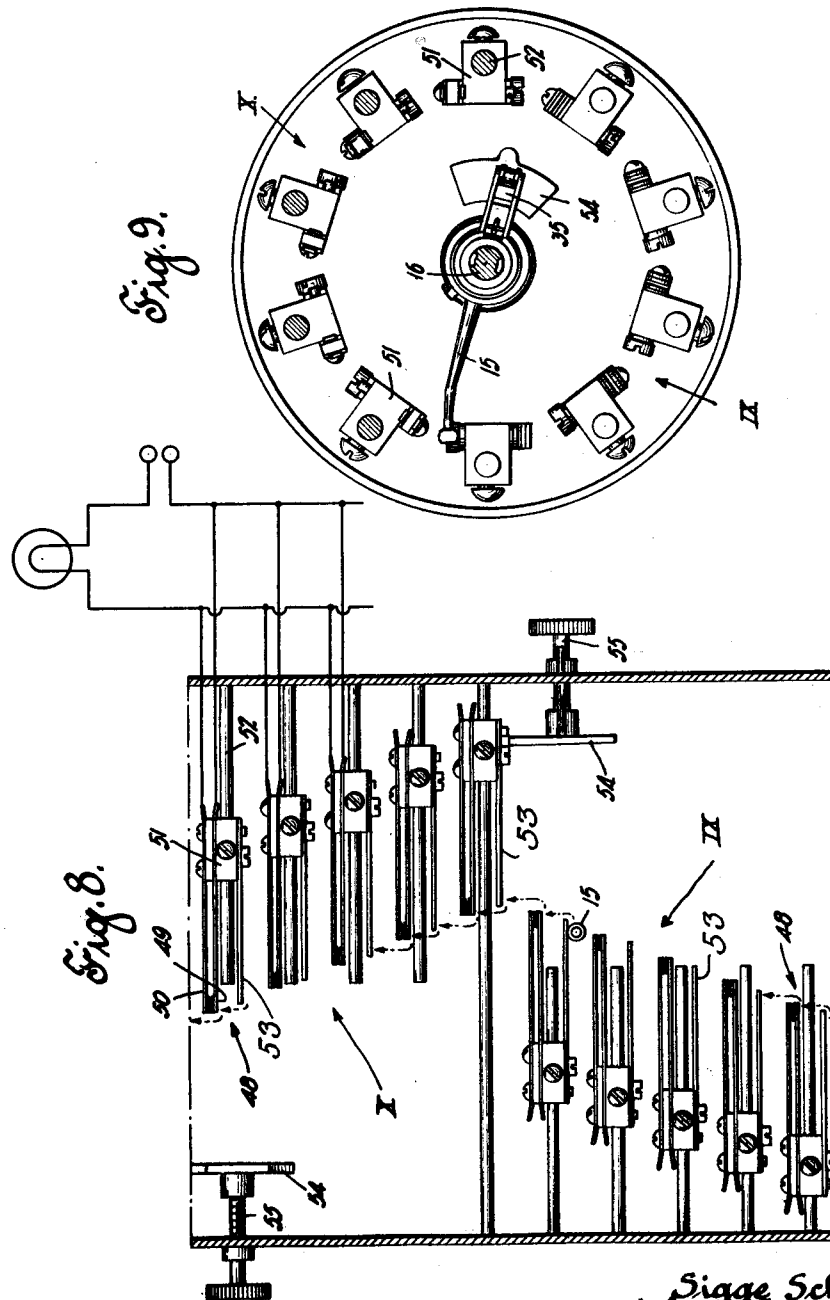
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AUTOMATIC TRAFFIC LIGHT CONTROL

Application filed December 3, 1927. Serial No. 237,576.

Our invention relates to an electric signal device, and is particularly though not exclusively adapted for a street traffic light control.

It is a general object of the invention to provide an improved form of traffic light control, which will be relatively simple and positive in its action, and which is not likely to fail or get out of order.

It is a more specific object to provide an improved traffic light control, wherein the timing of the light periods may be very simply and quickly varied.

It is a further object to provide a traffic light control, which will be very flexible; that is to say, which may be adapted for locations having any number and relative relation of intersecting streets.

Further objects and features of structural and functional advantage will hereinafter appear.

In the drawings which show, for illustrative purposes only, a preferred form of the invention—

Fig. 1 is a top plan view of a traffic light control device illustrating features of the invention;

Fig. 2 is an enlarged sectional view of a contact making and breaking device illustrating features of the invention;

Fig. 3 is a transverse sectional view through Fig. 1 and illustrating diagrammatically the electrical connections to said device;

Fig. 4 is a diagrammatic view similar to Fig. 3, but showing the control device wholly in diagram;

Fig. 5 is a diagrammatic view illustrating capability of control of four-way streets by the forms illustrated in Figs. 3 and 4;

Fig. 6 is a diagrammatic view of a traffic light control device employing relays capable of controlling six-way streets;

Fig. 7 is a diagram of six-way streets ca-

pable of being controlled by the device illustrated in Fig. 6;

Fig. 8 is an expanded view of another form of contact arrangement; and

Fig. 9 is a transverse sectional view.

Referring now particularly to Figs. 1, 2 and 3 which represent one operative form of the invention, 5 indicates a housing or case for the operative parts of the light control. In one end of the casing, we mount four sets of electrical contact members designated I, III, V and VII. In the opposite end of the casing, we mount corresponding sets of contact members designated, II, IV, VI and VIII. The contact devices in opposite ends of the casing are preferably arranged in staggered relation. Since each of these contact devices may be and preferably is the same as every other of the contact devices, only a single one will be described, and this one may be regarded as typical of the others. For example, the contact device indicated at station "VIII", includes a pair of arms 6—7, which are connected to binding posts 8—9 at the outside of the casing.

A spring contact arm 10 is secured to the casing and is connected to a binding post 11 at the outside of the casing. The arm 10 carries contacts 12—12 for direct contact with the corresponding contact members 6—7. The spring arm 10 normally holds the contacts 12 away from the contacts 6—7, and consequently the circuit remains open, but, when the arm 10 is depressed, the three binding posts 8, 9 and 11 are electrically connected. As shown more particularly in Fig. 1, the arms 10, secured to one end of the casing, extend inwardly practically to the plane through the ends of the arms 10 secured to the opposite end of the casing, for a purpose which will appear.

The arms 10 are depressed so as to make contact as heretofore described by a suitable contactor 15, shown in detail in Fig. 2. The contact arm 15 is reciprocated back and forth

for the purpose of making the contacts at one end of the casing and then at the other. Where more than two opposite contact devices are employed, we prefer to space these contact devices circularly about the center of the casing as shown in the drawings, and the contactor 15, in addition to being reciprocated, is rotated so as to make and break contacts one after the other about the casing.

In the form shown, we employ a driving shaft 16, which may pass through the casing centrally and be journaled therein. This driving shaft 16 is driven at an appropriate speed by means such as an electric motor 17 through suitable gearing. Mounted upon the shaft 16 is a sleeve 18, which carries a partially rotatable ring 19 between the collars 20—21. The contactor arm 15 is secured to this ring 19, and, in the form shown, carries an insulating roller 22 for engagement with the spring arms 10 of the contact devices. The extent of relative rotation between the sleeve 18 and the contact arm 15 is determined by a pin and slot connection 23, shown in Fig. 2. Where eight separate contact devices are employed, all substantially equally spaced, the extent of relative rotation between the sleeve 18 and the contact arm 15 will preferably be slightly more than one-eighth of a revolution. The contact arm 15 is always urged, and is at times rotated relatively to the sleeve 18 by means of a spring 24, which may be secured at one end to the sleeve 18 and at the opposite end to the ring 19, as shown at 25 in Fig. 1. When free to do so, the spring 24 moves the arm 15 to its limit of rotation, as determined by the pin and slot connection 23. During the operation of the device, however, this maximum movement is not obtained.

The driving shaft 16 is provided at one end with a right hand thread 26, and at the opposite end with a left hand thread 27. A nut 28 fits the right hand thread 26, and is at times freely rotatable in a counterbore in the sleeve 18. A corresponding nut 29 fits the left hand threaded portion 27, and is likewise at times freely rotatable in a counterbore in the other end of the sleeve 18. The driving shaft 16, in the form shown, rotates constantly in the same direction, and I employ a friction drag 30 secured to the sleeve 18, and frictionally engaging the periphery of the shaft 16. The frictional force of the friction device 30 on the shaft may be suitably regulated as by means of an adjusting screw 31.

Now, it will be clear that, when the nut 28 is held against rotation relatively to the sleeve 18, and the sleeve 18 prevented from rotation, the right hand screw 26, being in engagement with the nut 28, will move the sleeve 18 in one direction, depending upon the direction of rotation of the shaft 16. In the same manner, if the nut 29 be held against rotation on the sleeve 18, and the nut 28 be free of the sleeve 18, the latter will be moved

in the opposite direction. In the preferred form illustrated, we employ clutch means for causing either sleeve 28 or 29 to be held against rotation relatively to the sleeve 18. We also preferably employ snap over means, so as to cause one nut to be freed of the sleeve at substantially the same instant that the other nut is clutched thereto. In the form shown, a clutch arm 32 is pivotally mounted on the sleeve 18 preferably by being supported upon a plate spring 33, as shown more particularly in Fig. 2. When the lower end of the clutch arm 32 is moved toward the left as viewed in Fig. 2, the inclined upper face of the clutch arm engages the nut 28 with progressively increasing force, and causes the nut 28 to be held against rotation relatively to the sleeve 18. We employ a corresponding clutch arm 34 for the nut 29, and both clutches operate in the same manner. In order to actuate the clutch arms 32—34, we may employ an actuator bar 35 slidably carried on ways or rollers 36—36 secured to the sleeve 18. A spring 37, which is tensioned, acts upon a snap over rod 38 engaging the spring and the actuator bar 35, and serves to hold the bar in the left hand position illustrated in Fig. 2, or in the corresponding right hand position. As soon as the actuator bar 35 has been moved toward the right until the snap over rod 38 is just past the vertical position, the spring 37 acting through the rod 38, will snap the actuator bar 35 toward the right, thus moving the clutch arm 32 and freeing the nut 28 from the sleeve 18, and substantially at the same instant causing the clutch arm 34 to be moved so as to clutch the nut 29 to the sleeve 18.

It will be clear now that, when the sleeve 18 is held against rotation, the latter will be moved in one direction or the other by the nut 28 or 29. During this longitudinal movement of the sleeve 18, the actuator bar 35 is, of course, carried with it, and we take advantage of that fact by positioning stops so as to actuate the bar 35. As shown particularly in Fig. 1, one stop 39 is employed for each contact device, and since there are eight contact devices shown, we employ eight stops 39. The stops 39—39 in the form illustrated, are slidably mounted upon rods 40—40, and are held in position by pins 41—41 extending through slots 42—42 shown in Fig. 1. Thumb nuts or the like 43—43 serve to clamp the pins 41, and consequently the stops 39—39, in any desired position within the limits of the slots. The stops 39—39 are positioned in the appropriate path of movement of the actuator bar 35, so that when the actuator bar contacts with one of the stops, it will be moved, and the direction of longitudinal movement of the sleeve 18 reversed, as heretofore described. Since the period during which contact is made on each of the contact devices heretofore described is determined

by the length of time the actuator 15 holds the contact members together, and since this time is dependent upon the extent of reciprocation of the sleeve 18, it will be clear that, by adjusting the stops 39—39 as desired, the period during which the contacts are in engagement may be correspondingly determined.

The operation of the device is as follows:
When the driver 16 is rotating, the sleeve 18, together with the contactor 15 reciprocates. With the contactor in the position indicated in Figs. 1 and 3, the contacts at station VIII will be closed. If we assume the sleeve 18 to be moving toward the left, as viewed in Fig. 1, the contactor 15 will soon be freed of the contact spring arm 10, and the spring arm 10 will then open the circuits at station VIII. The coil spring 24 almost immediately rotates the contactor 15, so as to cause it to engage the spring arm 10 at station I and close the contacts at that station. The sleeve 18 in continuing to move toward the left will maintain contacts at station I closed. During this continued movement of the sleeve 18 toward the left, the friction drag 30 will cause the sleeve 18 to rotate at the angular speed of the drive shaft 16, and thus again tension the spring 24. As soon as the limit of relative movement between the sleeve 18 and the sleeve 19 carrying the contactor 15 has been reached, the friction drag 30 begins to slip, and there will then be no further relative rotation between the sleeves 18 and 19 at that station. When the left hand limit of reciprocation of the sleeve 18 is reached, one of the stops 39 will engage the actuator bar 35, and thus reverse the direction of reciprocation of the sleeve 18, as heretofore described. The sleeve 18 then begins to move toward the right, and, when the roller 22 is free of the spring arm 10 at station I, the spring 24, which has previously been tensioned, snaps the arm 15 into engagement with the spring arm 10 at station II. This continued reciprocation and rotation of the sleeve 18 and tensioning of the spring 24 continues so that the contacts at each of the stations I to VIII, will be made and broken one after the other, thus completing a complete cycle of the machine.

All of the contact arms 10, or rather the binding posts secured thereto, are preferably connected together, and lead to one line wire 45, as indicated in Figs. 3 and 4. The other contacts, such as 7 and 8, are connected through appropriate lamps, depending upon which contacts are in engagement, to the opposite line wire 46. In the form illustrated in Figs. 3 and 4, the top row of lights may be red—one for each of the four streets shown in Fig. 5. The second row of lights may be amber colored. The third row of lights may be of violet color, and the fourth or bottom row may be green. Four lights

are thus visible at different times from each of the four streets. With the connections illustrated in Figs. 3 and 4, the light combinations shown in the table below will be visible. In the table there are eight periods, and the streets are designated 1, 2, 3, 4 and the colors of the lights are indicated by the first letters of the color. The light periods indicated by Roman numerals are those corresponding to the same numerals appearing in Figs. 3 and 4.

Period	Lights	
I	G ₁ G ₃	R ₂ R ₄
II	A ₁ A ₃	R ₂ R ₄
III	V ₁ V ₃	R ₂ R ₄
IV	A ₁ A ₃	A ₂ A ₄
V	R ₁ R ₃	G ₂ G ₄
VI	R ₁ R ₃	A ₂ A ₄
VII	R ₁ R ₃	V ₂ V ₄
VIII	A ₁ A ₃	A ₂ A ₄

In that form shown in Fig. 5, we employ six contact devices instead of eight, and employ relays for making the actual connections to the lights. In Fig. 6, the top row of lights may be red, one for each of the six streets, the middle row may be correspondingly amber, and the bottom row green, one for each street. The connections employed in Fig. 6 will produce the results shown in the table below:

Period	Lights	
I	R ₂ R ₃ R ₄ R ₅	G ₁ G ₄
II	R ₁ R ₂ R ₃ R ₄	G ₂ G ₄
III	R ₁ R ₃ R ₄ R ₅	G ₂ G ₃
IV	R ₁ R ₃ R ₄ R ₅	G ₂
V	R ₁ R ₂ R ₄ R ₅	G ₂ G ₃
VI	A ₁ A ₂ A ₃ A ₄ A ₅ A ₆	

Instead of arranging the contact devices in staggered relation in opposite ends of the casing, the contacts may be arranged in stepped sets positioned alternately at opposite ends of the casing 5. As shown in Figs. 8 and 9, there are two sets of contact devices IX and X. Since each of these contact devices 48 may be and preferably is the same as every other one of them, only a single one will be described. For example, each contact device 48 includes contacts or contact arms 49 and 50, each connected with a conductor, and a block 51 carrying said contacts and adjustable along a mounting rod 52 projecting into the casing from an end wall thereof. There is also a bar 53 for causing a dark period, secured to block 51

in a manner permitting longitudinal adjustment to vary the length of such dark period. It should be understood that the contacts 49 and 50 are insulated from each other and from the mounting rod 52, and that the dark period bar is also insulated from members 49, 50 and 52.

Assuming that the contact arm 15 is being shifted to the right in Fig. 8 it will pass step by step into cooperation with successive contact devices until the actuator bar 35 (Fig. 1) strikes a stop 54 adjustably positioned by means of screw 55 mounted in the right hand end (Fig. 8) of the casing. The contact arm 15 will then pass step by step into cooperation with successive contact devices illustrated in the upper right hand of Fig. 8.

As the contact arm shifts from one contact to another it ordinarily comes into engagement with the dark period bar 53 and the length of the period of its contact therewith is determined by the adjustment of the bar 53 on the block 51 and the position of the block on the mounting rod 52. Then ordinarily the contact arm 15 snaps into engagement with the contact 49 and presses it into engagement with the contact 50 to close a signal circuit and gradually moves off the contact 50 to cooperate with the next contact device.

It will be apparent that the control apparatus of our invention is exceedingly flexible in character, in that a great many different situations may be met without substantial changes in the device and that it may be used as a timing device for different forms of apparatus. By merely varying the electrical connections, various results may be obtained, and by the mechanical variation permitted by the various adjustments, the duration of any light period may be varied to suit the varying conditions met with in practice.

While the invention has been described in great detail and illustrative forms shown, we do not wish to be strictly limited to the present disclosures, since changes may be made within the scope of the invention as defined in the appended claims.

We claim:

1. In a device of the character described, a plurality of contacts, a reciprocable and rotary contactor, means for simultaneously reciprocating and rotating the same, and means for varying the limits of reciprocation of said contactor in both directions.

2. In a device of the character described, a plurality of contacts, a rotatable and reciprocatory contactor, a spring for moving said contactor rotatably, and means for automatically tensioning said spring after said contactor has been moved thereby.

3. In a device of the character described, a plurality of contacts, a contactor, a rotary

driving member therefor, friction means for causing said contactor to rotate with said driving member, and spring means for moving said contactor faster than said driving member, said friction means also transmitting power to intermittently increase the tension of said spring.

4. In a device of the character described, a plurality of contacts, a contactor, rotary driving means for reciprocating and intermittently rotating said contactor, and adjustable means for varying the extent of reciprocation of said contactor and controlling the timing of the intermittent rotary movement of said contactor.

5. In a device of the character described, a plurality of contacts, a contactor, a right and left hand threaded driving element for said contactor, clutch means for causing said contactor to be moved in one direction by the right hand threaded portion of said driving element, and in the opposite direction by a left hand threaded portion of said driving element, and means for throwing said clutch means.

6. In a device of the character described, a plurality of contacts, a rotary driving member having a right hand thread and a left hand thread thereon, a sleeve on said driving member, friction means for causing said sleeve to rotate with said rotary-driving member, clutch means for causing said sleeve to be driven by the left hand threaded portion of said driving member, and clutch means for causing said sleeve to be subsequently driven by the right hand threaded portion of said driving means, a contactor movably mounted on said sleeve, and a spring for moving said contactor relatively to said sleeve.

7. In a device of the character described, a plurality of contacts, a contactor, a rotary driving member for said contactor, means for causing said driving member to move said contactor in one direction, and snap action means for releasing said contactor from said rotary driving member.

8. In a device of the character described, a support having a plurality of contacts thereon, a rotary driving shaft, a contactor, means for causing said rotary driving shaft to reciprocate and rotate said contactor, and a plurality of adjustable stops for causing said rotary driving shaft to reverse the direction of motion of said contactor.

9. In a device of the character described, a support having a plurality of sets of contacts arranged in steps, alternate sets extending in opposite directions, a rotary driving shaft, a contactor, means for causing said rotary driving shaft to reciprocate and rotate said contactor, and a plurality of adjustable stops for causing said rotary driving shaft to reverse the direction of motion of said contactor.

10. In a device of the character described,
a plurality of contact devices, a rotatable
contactor adapted to operate said contact de-
vices in succession, and adjustable means
5 which cause predetermined periods of time
to elapse between the operation of said con-
tact devices by said contactor.

11. In a device of the character described,
a plurality of sets of contact devices arranged
10 in steps, alternate sets extending inwardly
from opposite directions, a contactor, and
means for causing said contactor to engage
in succession the contact devices of one set
and then of the next.

12. In a device of the character described,
a plurality of contacts circularly arranged,
a rotatable and linearly reciprocable contac-
tor, means to rotate and linearly reciprocate
said contactor, and spring means connecting
20 said contactor to its reciprocating and rotat-
ing means, whereby said contactor may ro-
tate relative to its rotating means.

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