

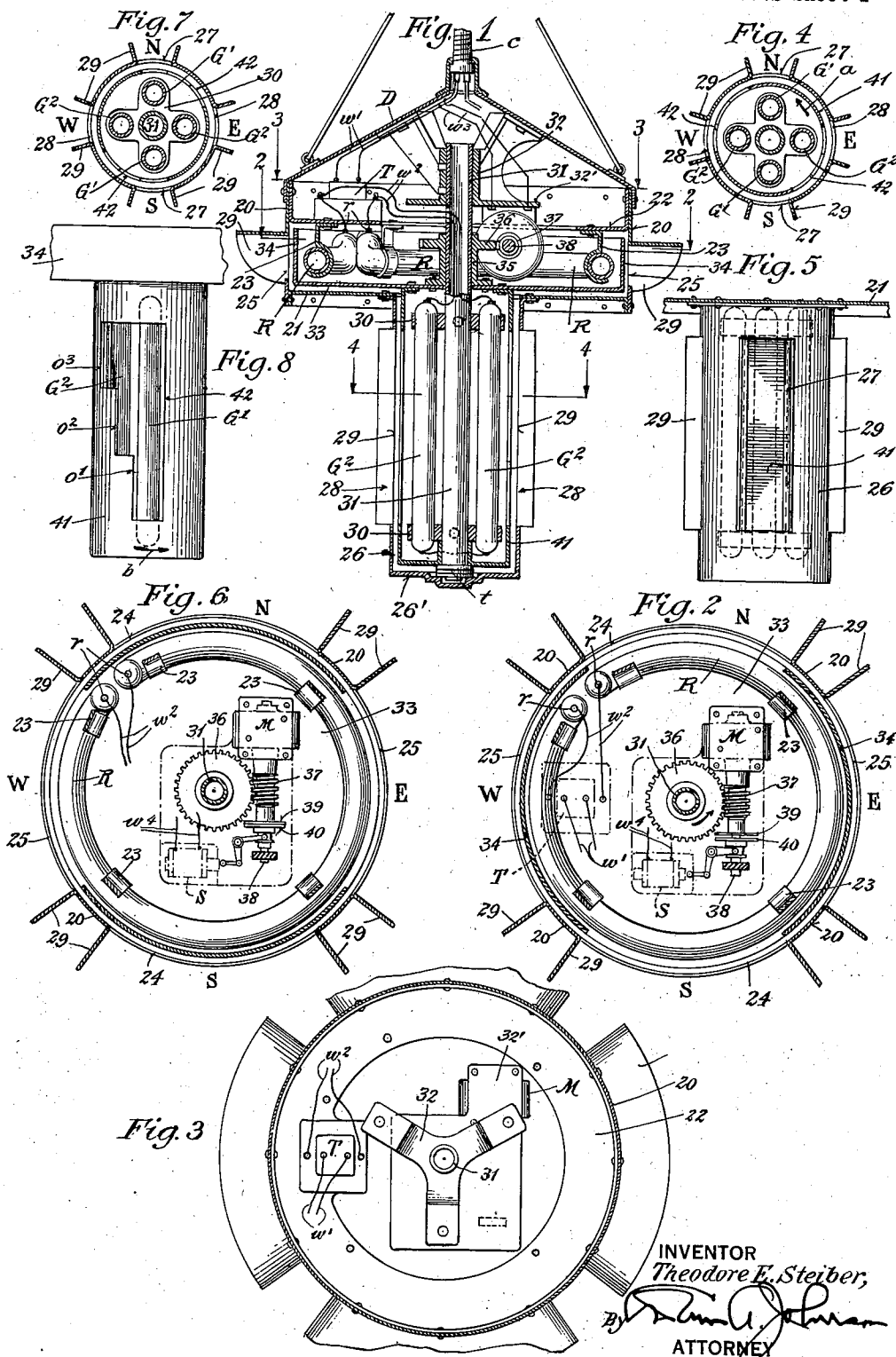
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T. E. STEIBER
TRAFFIC SIGNAL

2,264,253

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2 Sheets-Sheet 1



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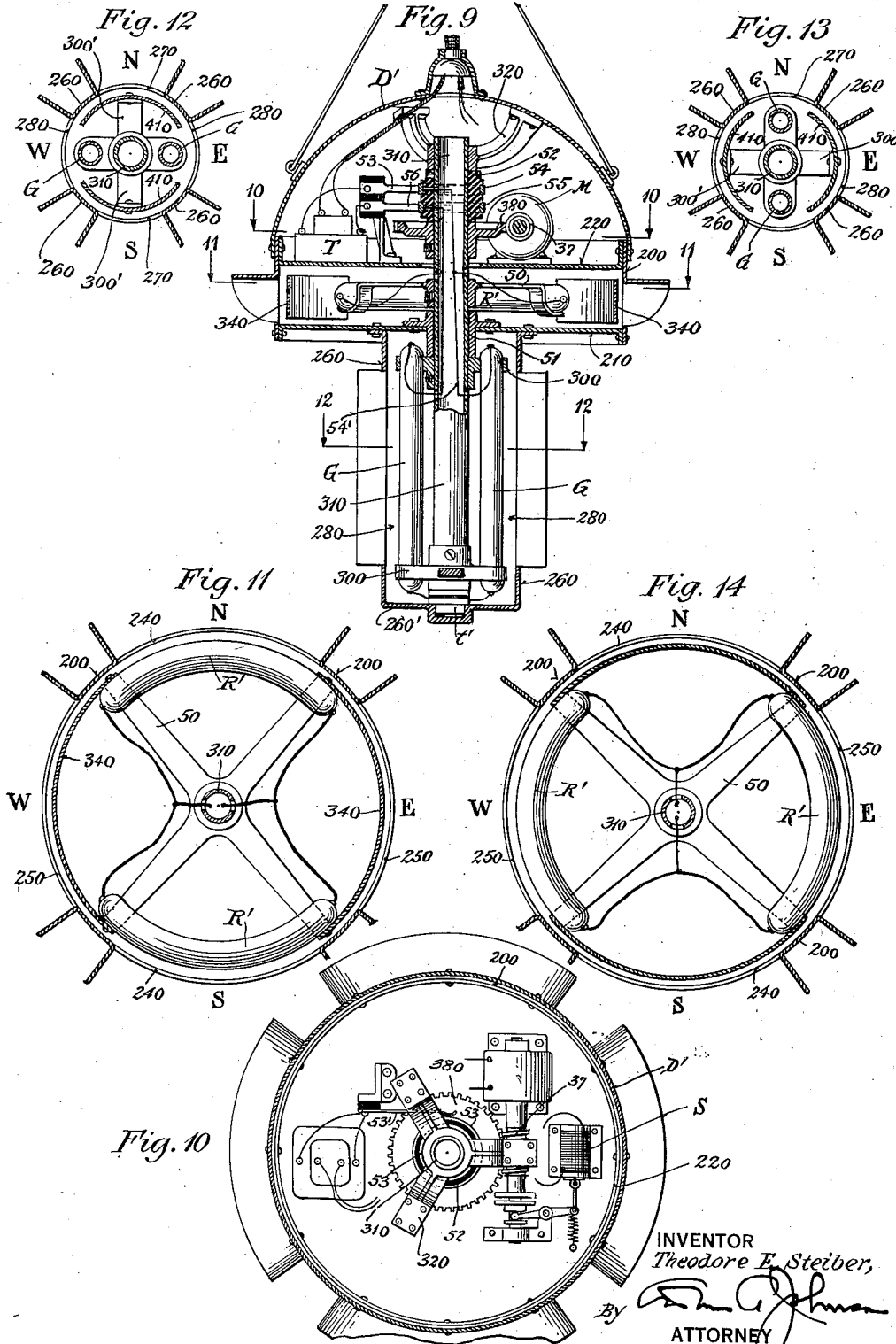
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UNITED STATES PATENT OFFICE

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TRAFFIC SIGNAL

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9 Claims. (Cl. 177—337)

This invention relates to signal devices, and more particularly to such as are adapted for controlling traffic.

In current systems of operating traffic lights, a yellow "caution" signal is displayed to indicate that both the red "stop" signal and the green "go" signal are about to be directionally reversed; but a driver approaching the intersection has no means of telling how soon the caution light will flash out and the still active respective red and green lights will flash into reverse, even before the yellow light goes out. In some instances the "caution" light is not used at all, and the red and the green lights reverse quickly and simultaneously, in which case the drivers approaching the intersection have absolutely no knowledge when the reversing of the lights will occur, and cars moving under speed in the lane protected by the green light are therefore apt to traverse the intersection after the light change has taken place and the red light shows against him.

Further, there are instances when all red and all green lights are flashed so as to be visible at the same time, this double showing to constitute a "caution" signal, but even then there is no indication of how soon the lights will indicate "go" and "stop" in the respective lanes, individually.

The present invention, in a broad sense, aims to provide a signal system in which the illuminated areas of the red and green signals respectively are, when normally active, exposed to the fullest extent; but, when the lights are about to be reversed, these fully-lighted areas of both active sets (red and green) will be gradually diminished in a manner whose effect is similar to that of a shade or shutter which moves slowly so that the progress of its covering-up movement can be readily observed, in contradistinction to the usual rapid flash of the lights being switched on or off suddenly.

For example: Supposing a driver is in a lane in which the red "stop" light is against him (no green "go" signal being visible), he will come to a full stop. Now, when the lights are about to be reversed, he will be able to observe not only a gradual diminishing of the lighted red area, but also the final and quick appearance of light in the area pertaining to the green signal, and consequently cannot start before the red signal has entirely disappeared and the green area is then fully illuminated.

A driver running in a lane protected by the green "go" light, will, when the lights are about to change, observe a gradual diminishing of the

illuminated green area, and also the initial and gradually-increasing illumination of the red or "stop" light area, thus enabling him to come gradually to a full stop when the seriatim light change has been finally completed, and only the red area is illuminated for him.

According to one aspect of the present invention, the red and green lights are stationary and constantly "on," instead of being switched "off" and "on," a shutter being preferably interposed between the light and the casing apertures and partially rotated periodically by a small electric motor, so as to show and/or hide the light emanating from the illuminating media, into the proper traffic lanes, respectively. The fact that all of these illuminating media are here adapted to be continually "on" during the operation of the traffic light, is very advantageous and permits the use of electric light bulbs as well as neon tubes without requiring any distributing commutator or other switches such as are usually employed, a feature which is important especially in connection with the neon tubes whose voltage is very high and therefore apt to cause considerable arcing whenever the current is switched "off." When neon or similar tubes are used, only one pair of primary-current wires are required for carrying energy supply from the street box to the transformer which is located in the light-housing and steps-up the primary current into a secondary current of the proper voltage required for the light media, and does not require any switching.

As to the motor for rotating the shutter above referred to, current may be supplied by the same primary-circuit wires just mentioned, in which case the motor would run continuously and a simple solenoid circuit (operated by a clock-work in the street box) may be used for clutching or releasing the motor shaft to/from the drive-element of the shutter, the wires necessary for operating the solenoid only carrying a low voltage current.

Further features and advantages will be apparent hereinafter and in connection with the drawings, in which:

Figure 1 shows a central vertical section of a traffic light embodying my invention.

Fig. 2 is a horizontal section taken on line 2—2 of Fig. 1.

Fig. 3 is a similar section, on line 3—3 of Fig. 1.

Fig. 4 is a horizontal section on line 4—4 of Fig. 1.

Fig. 5 shows, in elevation, the lower portion of the light-housing.

Fig. 6 is plan, similar to Fig. 2, but showing the motor shaft clutched to the shutter-driving element.

Fig. 7 is a view similar to Fig. 4, but showing the shutter in a different position.

Fig. 8 is a side view of the lower portion of the revolving shutter.

Figs. 9 to 14 inclusive, illustrate a modification, the shutter being here stationary, while the lights are revolving;

Fig. 9 being a vertical central section of the entire device.

Fig. 10 is a horizontal section on line 10—10 of Fig. 9.

Fig. 11 is a section on line 11—11 of Fig. 9.

Fig. 12 is a horizontal section on line 12—12 of Fig. 9.

Fig. 13 is a similar section, the position of the lights being changed.

Fig. 14 is a view similar to Fig. 11, but shows a reversal in the positioning of the lights.

Considering first the preferred form of my invention, as illustrated in Figs. 1-8, inclusive, the traffic light comprises a two-part housing, the upper part of which consists of a substantially cylindrical box 20 having a bottom plate 21, an intermediate annular plate 22, and a dome D, all riveted together into a solid structure. Disposed within the compartment formed between the bottom 21 and annular plate 22, and supported on the underside of the latter by hangers 23, is a horizontal circular neon tube R, emanating, when energized, a red glow for its entire length, current being applied to the terminals *r*, the organization being such that the red light will be projected from the tube R through a series (4) of openings 24, 25 provided in the cylindrical housing-wall 20, one pair of openings (24) facing north and south; while the other pair (25) face east and west.

In a like manner, the lower cylindrical or tubular part 26 of the housing is provided with N and S openings 27, and E and W openings 28, and is rigidly attached to the underside of the bottom plate 21, as shown. All the openings 24, 25 and 27, 28 are confined as to directional visibility by "blinders" 29, so that the N and S red light rays from the tube R cannot be seen from the east or west approaches, and vice versa.

The lower housing-part 26 contains two pairs of vertical neon tubes G^1 , G^2 for throwing green light rays to N and S, and E and W, respectively, through the corresponding openings 27, 28 above mentioned.

Just as the upper red tube R is stationary in the upper part of the housing 20, so are all the vertical green tubes G^1 , G^2 held stationary in the lower housing-part 26, the upper and lower ends of the tubes being secured in a pair of 4-armed spiders 30 which are rigidly attached to a vertical tubular shaft 31 which is also stationary, its lower end being stepped in a recess of the bottom plate 26' of the housing 26, while its upper end is affixed to the hub of a spider bracket 32 which, in turn, is secured to the housing-dome D.

In order to directionally control the emanation of light from the tube R, there is provided a revoluble shutter comprising a bottom plate 33 having a pair of spaced vertical flange sectors 34 which, when they are revolved around the stationary central tubular shaft 31, will alternately permit red light to pass from the tube R through the N and S openings 27 (see Fig. 2), at the same

time shutting off the light through the E and W openings 28, or, upon a 90° movement, permit red light to pass through the E and W openings and shut off any light from passing through the N and S openings 27 (see Fig. 6).

Intermittent rotation is preferably imparted to the shutter as follows:

The shutter-bottom plate 33 has a fixed central hub 35 which is journaled on the tubular shaft 31 and carries a worm gear 36 engaged by a worm 37 which is loosely supported on the shaft 38 of a small electric motor M attached to the underside of a shelf 32' which forms a part of the stationary spider bracket 32 above referred to. The worm 37 has a friction disk 39 which may be clutched to the motor shaft 38 through the intervention of a companion disk 40 having a sliding-key connection with the motor shaft and adapted to be shifted to frictionally engage and drive the disk 39, by the energization of a solenoid S to which current is supplied periodically by a clock mechanism preferably located in the street box (not shown). Any suitable and well-known device may be used for automatically arresting the rotation of the worm gear at the end of each 90° movement, to ensure proper positioning and maintaining of the shutter flanges relatively to the housing openings during the rest period of the shutter.

While the shutter-flange sectors 34 control the visibility of the red or "stop" light from either N and S or E and W, so is the corresponding visibility of green or "go" light from either E and W or N and S controlled by a shutter tube 41 contained within the lower housing section 26 and firmly secured, at its upper end, to the underside of the shutter plate 33, so that when red shows N and S, green will show E and W, and vice versa. In order to provide this green visibility, the lower shutter tube 41 is provided with a pair of diametrically opposite apertures 42 of such size and shape that, when green E and W are fully visible, the N and S greens are completely shut off (see Fig. 4).

When the shutters are now revolved in anti-clockwise direction (arrow *a*) to the position shown in Fig. 7, the visible E and W green areas will be gradually reduced, or moved out of register with the housing apertures 27 or 28, step-by-step, due to the fact that the shutter openings are of a peculiar shape (see Fig. 8), viz.: Circumferentially there are three 30° connected opening zones, of which the first one (ϕ^1) is full length vertically, the second one (ϕ^2) is only two-thirds long, vertically, and the third (ϕ^3) is only one-third long vertically. In other words, the first 30° rotation of the shutter in an anti-clockwise direction (as per arrow *b* in Fig. 8) will reduce the visibility of green tube G^1 to two-thirds of its full or maximum area, the next 30° rotation of the shutter will reduce the exposure of the tube G^1 to only one-third of its original area, and the next and last 30° rotation of the shutter will hide the tube G^1 completely, thus accomplishing the above stated desirability of giving notice to an approaching driver that the lights are about to change and thus give an opportunity of modifying the car speed accordingly.

It may be well to state here that, if, for some reason or other, it should be desirable to reverse the sequence of exposing the green lights so as to have their visible areas increase (instead of decrease as above described) during the change period, a reversal of the motor will accomplish that end, without affecting the gradual reduc-

tion or the increase or decrease of the red-light visibility in any way, whatever.

Furthermore, the use of the reversible motor above noted may also be a desirable control when the traffic lanes are not intersecting each other at right angles, in which case the shutter sections would naturally vary in their horizontal lengths, and the alternate opening and closing of the casing apertures could be readily effected by imparting to the shaft 31 a periodical oscillatory movement, instead of the progressively-advancing rotary movement above described.

In the type of traffic light built in accordance with my present invention and fully described above, the light tubes are all stationary, while the shutter is rotatable around them to control the visibility of the light, green as well as red, emanating from the tubes into the traffic lanes. Primary current is supplied from the street box through wires W¹ to a transformer T which steps-up the voltage to that required for the circuit for neon tubes and supplied thereto through wires W². If it is desired to run the shutter motor continuously when the traffic light is in service, the current-supply wires W³ may be tapped into the primary-circuit wires W¹ which lead to the street box through a suitable cable c connected to the dome D. Inasmuch as the combination shutter unit is rotatable, while the light tubes and other parts are stationary, the vertical central supporting shaft 31 for the shutter is tubular to permit the passage of the stationary light wires to their respective terminals on the tubes, the stationary tubular shaft 31 therefore serving as a rigid member on which the shutter, as a unit, is rotatively supported, a thrust bearing t being preferably placed in a stepped-in recess provided for it in the bottom plate 26' of the lower housing 26, (see Fig. 1), to support the shutter load in easy-run condition.

The solenoid S, preferably used and illustrated for actuating the motor shaft—worm clutch, requires only a pair of low-tension wires W⁴ which are also contained within the cable C and lead to the street box where they are connected with a suitable clock-controlled or hand-manipulated switch for periodically rotating the shutter to change the lights as required.

In Figs. 9 to 14 inclusive, there is shown a modification of my improved traffic light, the construction here shown incorporating merely a change in the particular operation of changing the lights for the traffic lanes by moving one movable part of the device relatively to another or stationary part. In the former instance (above described) the rotatable shutter was shifted relatively to stationary lights, while in the modification the lights are revolved relatively to a stationary shutter or a shield.

In the drawings: The traffic light comprises a two-part housing, the upper part of which consists of a substantially cylindrical box 200 having a bottom plate 210, an intermediate plate 220 and a dome D', all riveted together into a solid structure. The circular box 200 has N and S apertures 240 and E and W apertures 250 which permit the passage of red light from a pair of oppositely-disposed neon-tube sectors R' carried on a four-armed spider 50 (see Fig. 11) which is secured to a vertical tubular shaft 310. This shaft is journaled at its top in a spider bracket 320, and at its lower end in a stepped bearing t' held in the bottom plate 260' of the lower housing part 260 which is solidly secured to the un-

derside of the bottom plate 210 pertaining to the upper housing 200.

To further increase the stability of the rotatable tubular shaft 310, the bottom plate 220 has also an intermediate bearing sleeve 51.

When the red tube sectors are in the position shown in Fig. 11, red light will emanate through the N and S apertures 240 of the casing, thus stopping traffic in the N—S lane. On the other hand, all red light is shut off from the E and W apertures by a pair of shields 340 whose ends are secured to companion arms of the four-armed spider 50, respectively. A 90° rotation of the central tubular shaft and, with it, the spider 50 and shields 340, will result in gradually closing or covering the N and S apertures of the upper casing 200, at the same time moving the red tube sectors so as to emanate light through the E and W apertures in a gradual and easily-discernible manner, until the positions shown in Fig. 14 have been reached, at which time a full-length horizontal bar of red light will be displayed to the E and W traffic lanes, and traffic will be stopped.

The green lights cooperatively operating with the red-light sectors consist of one pair of vertical green-light tubes G held in a pair of superposed spiders 300 which are firmly secured to the central shaft 310 but so that, when the red sectors shine into N and S lanes through the apertures 270, the green tubes will emanate their light to the E and W lanes through a pair of oppositely-disposed apertures 290 in the lower housing-part 260. In order to confine the showing of green light to the particular lane which is to be controlled by it, I have provided on each of the spiders 300 a pair of extra arms 300' to carry shields 410 which effectively prevent all green-light leakage into the "stop"-controlled lane during the stop-traffic period.

When the lights are changing, the green tubes will be revolved around and with the central shaft 310 and gradually enter the zone of the next aperture of the series, there come to a period halt, and then shift again to the next aperture.

As before mentioned in connection with the first-named and previously described traffic light, the modified form also has a similar transformer T; but, inasmuch as in this instance the central tubular shaft is rotatable, there is provided near the upper end of the tube a commutator preferably consisting of a body of insulating material 52 firmly secured to said tube and having a pair of spaced annular metallic bands 54, 55 which are electrically connected with the terminals of both, the red as well as the green tubes, the connecting circuit wires being contained within the tube shaft 310. A circuit of high voltage current is established from one transformer-terminal through a brush 53, commutator band 54, wire 54' to one terminal of each light tube, the return being effected by a wire from the other terminal of each light tube, to the commutator band 55, to the lower brush 56 to the other transformer terminal.

Intermittent rotation may be imparted to the central tubular shaft in the same manner as previously described in connection with the rotary shutter, viz. by an electric motor M, worm 37, worm gear 380 attached to the central tubular shaft 310, and solenoid clutch control, all as above mentioned.

Variations and modifications may be made

within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. A traffic-signaling device comprising a housing including a pair of superposed light-containing parts, each part provided with a series of horizontally-alined apertures, the apertures of one part being also in vertical alinement with those of the other part, respectively; a central vertical shaft journaled in the housing-parts; light media carried by said shaft for emanating "stop" light through an aperture in one housing part in one direction, and simultaneously a "go" light through an aperture in the other housing-part in another direction; and means for rotating said shaft for bringing said lights respectively into and out of register with their proper housing apertures, alternately, said rotating means operating during the period when the signals are being changed to gradually vary the amount and position of the light visible through the apertures to indicate the part of the changing period that has elapsed.

2. A traffic-signaling device comprising a housing including a pair of superposed light-containing parts, each part provided with a series of horizontally-alined apertures, the apertures of one part being also in vertical alinement with those of the other part, respectively; a central vertical shaft journaled in the housing-parts; light media secured to said shaft for emanating a "stop" light through an aperture in one housing-part in one direction, and simultaneously a "go" light through an aperture in the other housing-part in another direction; and means for rotating said shaft after predetermined intervals in either direction for bringing said lights respectively into and out of register with their proper housing-apertures, alternately, to change the signal from "stop" to "go" or vice versa, said means operating step by step during the changing period to gradually vary the amount of light visible through the openings to indicate the part of the changing period that has elapsed.

3. A traffic-signaling device comprising a housing having a series of "stop" and "go" apertures; lights normally visible through the apertures of each series respectively; shutters for each set of cooperative apertures; and periodically operated means for moving said shutters simultaneously for alternately opening and closing said apertures to expose the "stop" light for one lane and the "go" light in another lane and vice versa, said shutters being so constructed and arranged as to gradually vary the portion of light visible through the apertures to indicate the part of the changing period that has elapsed, and to maintain the amount of light visible through the opened apertures fixed during the intervals between the periodic signal-changing operations of said shutter-moving means.

4. A traffic-signaling device comprising a housing having a series of "stop" and "go" apertures; lights normally visible through the apertures of each series respectively; shutters for each set of cooperative apertures; and periodically operated means for moving said shutters simultaneously for alternately opening and closing said apertures to expose the "stop" light for one lane and the "go" light in another lane and vice versa and for maintaining said shutters stationary between the periodic operations thereof, said shutters being constructed to deliver a fixed amount of light to the open apertures when stationary and being operated step

by step during the period when the signals are being changed from "stop" to "go" and vice versa to gradually vary the portion of light visible through the apertures to indicate the part of the changing period that has elapsed.

5. A traffic-signaling device comprising a housing having a series of "stop" and "go" apertures; continuously illuminated "stop" and "go" lights cooperative with said apertures respectively in different directions for controlling traffic in the several directions by projecting a fixed amount of light through appropriate apertures between intermittent signal-changing periods; and means for revolving said lights simultaneously at predetermined intervals for bringing said lights into and out of register with the apertures respectively, said means being constructed and arranged to gradually vary the amount of light visible through the apertures when the signals are being changed from "stop" to "go" or vice versa to indicate the part of the changing period that has elapsed.

6. A traffic-signaling device comprising a housing having a series of "stop" and "go" apertures; continuously illuminated "stop" and "go" lights cooperative with said apertures respectively in different directions for controlling traffic in the several directions by projecting a fixed amount of light through appropriate apertures between intermittent signal-changing periods; and means for revolving said lights simultaneously at predetermined intervals for bringing said lights into and out of register with the apertures respectively, said means being operated step by step during the period when the signals are being changed from "stop" to "go" or vice versa to gradually change the amount of light visible through the apertures when the signals are being changed to indicate to an approaching driver that the lights are changing and the extent to which the changing period has expired.

7. A traffic-signaling device comprising a housing having a vertical enclosing wall provided with a series of horizontally-alined "go" apertures; a continuously illuminated light medium normally adapted to project light through all of said apertures; and a shutter device comprising a vertical tubular wall interposed between said light medium and the casing wall, and having an opening of gradually-increasing vertical breadth; and means for periodically moving said shutter device for changing the direction of the signal by bringing the broadest part of said opening slowly out of register and successively narrower parts thereof into register with a "go" aperture of the housing, and finally bringing said broadest part into register with the succeeding "go" aperture as the preceding aperture is completely masked by the shutter, said means maintaining the shutter stationary between said signal changing periods in said final position, whereby a fixed maximum quantity of light is projected through the illuminated apertures.

8. A traffic-signaling device comprising a housing having a pair of superposed cylindrical parts provided respectively with a series of horizontally-alined apertures in superposed positions relative to each other; light media normally projecting light of contrasting colors through said sets of apertures, respectively; a central vertical shaft secured to the housing; a shutter journaled on said shaft; and means for changing said signals by rotating said shutter periodically to close the apertures of one housing-part in one direction, and simultaneously open the apertures

of the other housing-part in another direction, said means maintaining the shutter stationary between said signal-changing periods in a position for projecting a fixed quantity of light through the opened apertures, and gradually varying the amount of light visible through the apertures when the signals are being changed from "stop" to "go" or vice versa to indicate the part of the changing period that has elapsed.

9. A traffic signal device comprising a housing having a series of "stop" apertures and a series of "go" apertures; continuously illuminated means comprising a plurality of gaseous discharge tubes producing light of contrasting colors, for projecting light of one color through

the "stop" apertures and light of another color through the "go" apertures; means including said tubes for alternately projecting contrasting light respectively through a "stop" aperture in one direction and a "go" aperture in another direction and vice versa, to control traffic in several directions, and for maintaining the amount of projected light fixed during the major portion of each alternate projection period; and means operable periodically to gradually change the amount of light visible through the apertures when the signals are being changed from "stop" to "go" or vice versa, to indicate the part of the changing period which has elapsed.

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