Jan. 21, 1941. E. C. WILLIAMS 2,229,234

SIGNALING SYSTEM

Filed Aug. 11, 1936 2 Sheets-Sheet 1

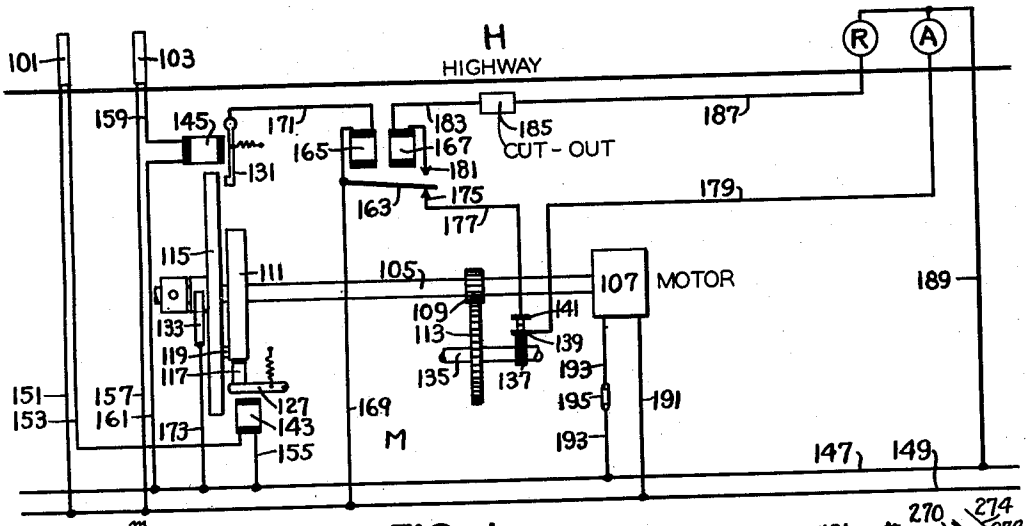


FIG. 1

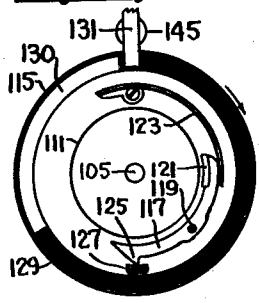


FIG. 2

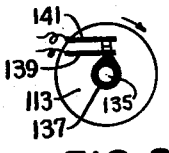


FIG. 3

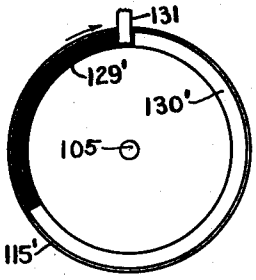


FIG. 4

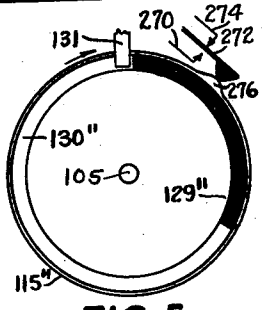


FIG. 5

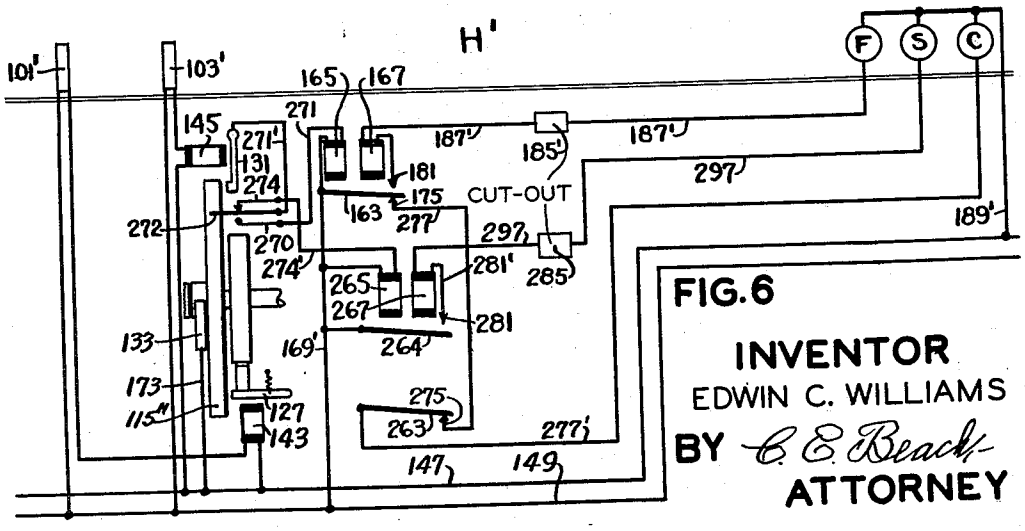


FIG. 6

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Jan. 21, 1941. E. C. WILLIAMS 2,229,234

SIGNALING SYSTEM

Filed Aug. 11, 1936 2 Sheets-Sheet 2

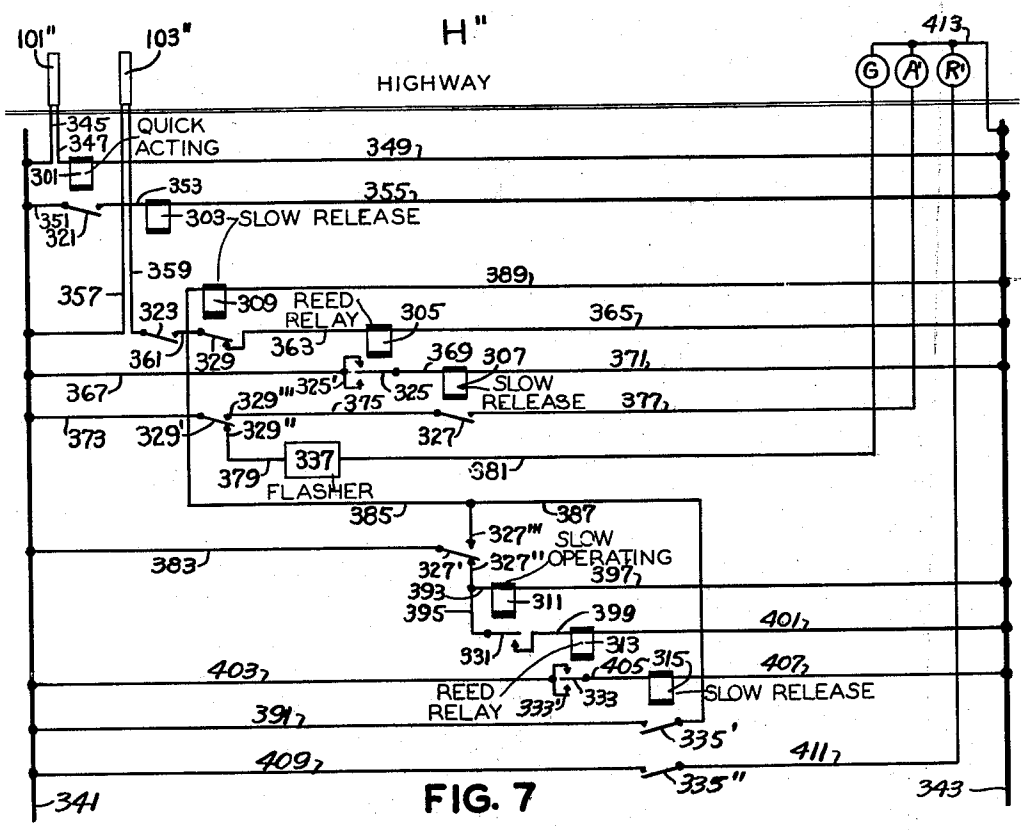


FIG. 7

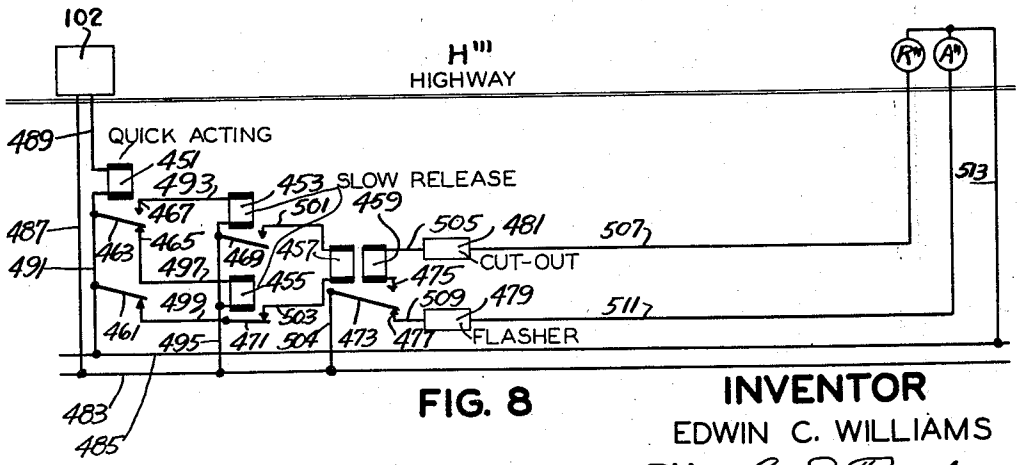


FIG. 8

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2,229,234

SIGNALING SYSTEM

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Application August 11, 1936, Serial No. 95,389

11 Claims. (Cl. 177—337)

This invention relates to signaling systems, and more particularly to systems for effecting manifestations or displays of signals responsive to the rate of occurrence of events or responsive to the duration of an event.

More specifically this invention relates to signaling systems for supervising the rate at which events occur by causing display of a signal aspect responsive to such rates as may be above or below a predetermined maximum or minimum respectively.

Signaling systems of this character may be advantageously utilized for many diverse purposes. For example, they may be used to give warning of the operation of a piece of mechanism at an excessive speed or at less than a desired speed; they may be used in conjunction with any and all types of traffic signals for presenting special signal aspects to those vehicles traveling at an excessive or inadequate rate of speed; and they may be used in almost any instance where warning is desired of the duration of an event beyond a predetermined maximum.

This invention is especially well suited for use on highways at points adjacent dangerous curves, hills, intersections, and the like, for the purpose of effecting display of warning or restraining signal aspects when vehicles operate at improper rates of speed.

It is an important object of this invention to provide a signaling system which will effect displays of characterizing signal aspects responsive to predetermined rate of occurrence characteristics.

It is another important object of this invention to provide a signaling system responsive to the duration of a predetermined event, for effecting displays of signal aspects indicative of the character of such duration.

Other and more specific objects and advantages will appear in the following description of illustrative embodiments of this invention, or will be apparent to those skilled in this art.

In certain preferred embodiments of this invention, the foregoing objects and others ancillary thereto are preferably accomplished as follows:

In one specific embodiment, the signal system comprises two sets of electrical contacts for consecutive operation responsive to the occurrence and progression of an event or condition, and mechanism for effecting display of a signal aspect of indicative character dependent upon operation of one of said contacts before or after (as the case may be) the elapse of a predetermined interval following the operation of the other of said contacts.

In another embodiment, the conditioning of a set of electrical contacts is altered for a time duration dependent upon the occurrence and progression of an event or condition, and mechanism is so responsive to duration of such alteration of conditioning that an indicative signal aspect will be displayed in the event a predetermined duration is not attained or is exceeded (as the case may be).

For the purpose of facilitating a ready understanding of this invention and what are considered to be its novel characteristics, embodiments thereof are represented in the annexed drawings and hereinafter described, which embodiments are utilized for the purpose of indicating excessive or inadequate rates of movements of vehicles along a highway; however, such embodiments, though practical, are by no means the only ones which the invention may assume, wherefore the invention is not confined to any strict conformity with the more or less diagrammatic representations of the drawings, but may be changed and modified in various particulars and utilized in many diverse unrelated situations so long as such changes and modifications make no material departures from the invention, as more particularly set forth in the annexed claims.

In the accompanying drawings like parts are designated by similar reference characters throughout the several views in which

Figure 1 is a diagrammatic view of an embodiment of this invention suited for utilization as speed supervising means responsive to consecutive actuation of circuit controllers by traffic moving along a vehicular highway;

Figs. 2 and 3 are detailed views of certain parts of Fig. 1;

Figs. 4 and 5 are views indicating alternative arrangements of certain parts shown in Figs. 1 and 2;

Fig. 6 is a diagrammatic view of a modification of the system of Fig. 1;

Fig. 7 is an "across-the-line" schematic wiring diagram of an embodiment of this invention which may be utilized in place of the system of Fig. 1; and

Fig. 8 is a diagrammatic view indicating an embodiment of this invention for response to duration of alteration of contact conditioning.

Structure—Figs. 1, 2 and 3

(To indicate excessive speed)

Referring now to Fig. 1, in conjunction with the detailed views of Figs. 2 and 3, a portion of a vehicular highway H has associated therewith means for displaying two signal aspects, represented by the lamp signals R and A, and two vehicular detectors or "pads" 101 and 103, which may be of any well known type such as, for example, that shown by reissue Patent No. 18,507, dated June 28, 1932, to J. I. Morris.

In the exemplification of Fig. 1, the pads 101 and 103 are assumed to be spaced apart a desired

distance—for example, on the order of twelve feet.

The signals R and A are situated along the highway a safe and convenient high-speed vehicular braking distance from pad 103. Such distance may well be on the order of two hundred and fifty or three hundred feet.

Mechanism M is associated with the signals R, A and with pads 101, 103 by conductors as will be hereinafter more fully described. Such mechanism M comprises a shaft 105 associated with a uniform speed motor 107 (such as a synchronous motor) for rotation thereby at a relatively slow uniform speed which may be, for example, sixty revolutions per minute or one revolution per second.

A wheel 111 is fixed upon the shaft 105 for rotation therewith and a disc 115 is loosely journaled upon the shaft 105 adjacent to wheel 111. Said disc 115 has a clutch dog 117 pivoted at 119 (see especially Fig. 2) and has a clutch face 121 for engaging the periphery of the wheel 111 responsive to the urge of the spring 123.

A member 127 controlled by the electromagnet 143 projects, during retracted positioning thereof, into the path of an end 125 of the clutch dog 117 for effecting withdrawal of said dog from engagement with the wheel 111 when the disc 115 is in its normal position, as indicated in Fig. 2.

A brush or contact 131 is movable toward and away from the disc 115, subject to control by the electromagnet 145, so that, when said contact is in one position, it may engage the section 129 or the section 130 carried by the disc 115, dependent upon the position of said disc. Section 129 is of insulating material and section 130 is of conducting material and electrically connected with the hub of said disc 115.

As best shown in Fig. 2, the insulating segment or section 129 may extend throughout an angle approximately 240° and the conducting segment or section 130 may extend between the ends of the segment 129, so that the segments 129 and 130 collectively form a ring, concentric with the disc 115, which ring the contact 131 may engage at any time during the rotation of said disc.

A brush 133 bears upon the hub of the disc 115 for frictionally resisting rotation of said disc and thereby serving to promptly stop the disc 115 in its "normal" or "at rest" position when the dog 117 is withdrawn from the wheel 111, as well as providing a current path through said hub and disc to the segment 130. The shaft 135 is driven through the gear 113 and pinion 109 at a speed preferably slower than that of the shaft 105. For example, said shaft 135 may operate at a speed of approximately twenty revolutions per minute. The insulating cam 137 is moved by the shaft 135 to close the contacts 139, 141 during each rotation of said shaft.

Conductors 147 and 149 lead from a source of electrical energy suitable for energizing the motor 107 and the various electromagnets, and for lighting the lamps R and A.

Conductor 151 connects supply conductor 149 with one terminal of the pad 101, conductor 153 connecting the remaining terminal of said pad 101 with one terminal of electromagnet 143 and conductor 155 connecting the remaining terminal of said electromagnet 143 with the other supply conductor 147.

Conductor 157 connects supply conductor 149 with one terminal of the pad 103, conductor 159 connecting the remaining terminal of said pad 103 with one terminal of electromagnet 145 and conductor 161 connecting the remaining terminal of said electromagnet 145 with the other supply conductor 147.

A contact member 163 is associated with the electromagnets 165 and 167, of which the magnet 165 serves as a pick-up magnet and the magnet 167 serves as a lock-up magnet. Said member 163 is connected through a conductor 169 with supply conductor 149 and with one terminal of the electromagnet 165. A conductor 171 connects the remaining terminal of magnet 165 with contact 131, and a conductor 173 connects brush 133 with supply conductor 147.

During concurrent deenergization of electromagnets 165 and 167, contact member 163 is biased for engagement with a contact 175. A conductor 177 connects said contact 175 with contact 141 and a conductor 179 connects contact 139 with one terminal of the signal lamp A.

During energization of one or both of the electromagnets 165 and 167, contact member 163 is positioned against its bias in engagement with a contact 181 which contact is connected to one terminal of electromagnet 167. A conductor 183 connects the remaining terminal of electromagnet 167 with one terminal of a so-called "cut-out" 185; which cut-out may be either mechanical, thermal or otherwise, wherein means is provided for momentarily opening an electric circuit a predetermined time after said circuit has been established. A conductor 187 connects the remaining terminal of cut-out 185 with one terminal of signal lamp R.

A conductor 189 connects the remaining terminals of signal lamps A and R with supply conductor 147.

A conductor 191 connects one terminal of motor 107 with supply conductor 149 and conductor 193, which serially includes a "shut down" switch 195, connects the remaining terminal of motor 107 with the other supply conductor 147.

Either the segment 129 or the segment 130 may be situated in the path of the contact 131 when the disc 115 is in its "normal" or "at rest" position, dependent upon the extent of rotation of the disc 115 which will occur within the time which it is intended shall elapse between the actuation of pad 101 and 103.

It will be obvious that attainment of desired results may be facilitated by normally positioning the initial part of the segment 130 in the path of the contact 131, if a comparatively slow starting type of mechanism is employed.

In any event, the relationship of parts should be such that, following operation of pad 101, if pad 103 is operated at a time indicating an objectionable rate of vehicle travel (either too fast or too slow, as the case may be) the conducting segment 130 will be in the path of the contact 131 at the time such pad 103 is operated.

Operation—Figs. 1, 2 and 3

(To indicate excessive speed)

Based on the assumptions that pads 101 and 103 are spaced apart a distance of twelve feet, that motor 107 rotates shaft 105 one revolution per second, that segment 129 extends through an angle of two hundred and forty degrees on the face of wheel 111, that electrical energy of proper character is applied to the various parts through the conductors 147 and 149, and that disc 115 normally comes to rest with the final portion of segment 129 underlying the brush 131;

the embodiment of this invention shown in Fig. 1 will normally cause an intermittent lighting of the signal lamp A, and will cause lighting of the signal lamp R for a predetermined length of time responsive to a vehicle proceeding from left to right along highway H at a speed of or in excess of twenty-five miles per hour.

More specifically, with parts arranged as just described and with no vehicles proceeding along highway H, motor 107 will rotate shafts 105 and 135 and wheel 111. The disc 115 will be held stationary through the friction applied to its hub by the brush 133 throughout disengagement of dog 117 from wheel 111 by member 127. Furthermore, electromagnets 165 and 167 will be deenergized and cam 137 will cause intermittent closures of contacts 139 and 141 thereby effecting intermittent display of the signal lamp A through a circuit including supply conductor 149 and conductor 169, member 163, contact 175, conductor 177, contacts 141 and 139, conductor 179, signal lamp A and conductor 189 to the other supply conductor 147.

Should the pad 101 be now operated by a vehicle, a circuit for the energization of electromagnet 143 will be established from conductor 149 through conductor 151, pad 101, conductor 153, winding of magnet 143 and conductor 155 to supply conductor 147.

Electromagnet 143 will thereupon cause member 127 to be swung out of the path of the end 125 of the clutch dog 117, permitting said dog to move under urge of spring 123 to carry its face 121 to engaging relation with the wheel 111, and disc 115 almost instantly will attain the speed of, and rotate thereafter synchronously with, wheel 111 in a clockwise direction as viewed in Fig. 2.

If such vehicle moves at a speed considered within desirable limits such as, for example, twenty miles per hour, it will travel approximately twenty-nine and one-third feet per second, and therefore will operate pad 103 a little more than two-fifths of a second after the operation of pad 101.

Operation of the pad 103 closes a circuit for the energization of electromagnet 145, which circuit leads from conductor 149 through conductor 157, pad 103, conductor 159, winding of magnet 145 and conductor 161 to supply conductor 147.

Energization of electromagnet 145 will cause its associated contact or brush 131 to be moved into engaging relationship with the segment ring 129—130. Since, by this time disc 115 will have been rotating for some two-fifths of a second; and as said disc, rotating at a speed of one revolution per second will, in such two-fifths of a second, move through an angle of more than one hundred and forty-five degrees, the conducting portion 130 of the disc 115 will have passed from beneath the brush 131 and the insulating segment 129 will then underly contact 131. Hence the associated circuits will be unaffected by energization of magnet 145.

The vehicle causing the aforesaid pad operations will therefore be enabled to continue along the highway H with no impeding signal aspects displayed to influence its progress.

Now assume that a vehicle approaches and successively operates pads 101 and 103 as before, however, this time the vehicle moves at what is considered an excessive rate of speed, say, for example, at thirty miles per hour.

Operation of the pad 101 will cause disc 115 to be rotated in precisely the same manner as hereinbefore described.

Since a vehicle moving at the rate of thirty miles per hour travels approximately forty-four feet in one second, pad 103 will be operated within less than three- tenths of a second after the operation of the pad 101.

In this situation, electromagnet 145 will become energized and contact 131 will engage segment 130 before such conducting segment 130 is withdrawn from beneath the contact 131; thereby establishing an energizing current path for electromagnet 165, which path leads from supply conductor 149 through conductor 169, winding of magnet 165, conductor 171, contact 131, disc 115 and its hub, brush 133 and conductor 173 to the other supply conductor 147.

Such energization of magnet 165 will cause contact member 163 to be moved from engagement with contact 175 into engagement with contact 181, thus opening the circuit hereinbefore described for displaying the signal A. Engagement of member 163 with contact 181 will effect closure of a circuit for displaying the signal R as well as for holding member 163 in engagement with contact 181. Such circuit leads from supply conductor 149 through conductor 169, member 163, contact 181, winding of magnet 167, conductor 183, cut-out 185, conductor 187, signal lamp R, and conductor 189 to the other supply conductor 147; magnet 167 forming a so-called "hold-up" magnet for contact member 163.

Signal R will now be displayed to the approaching vehicle instead of signal A and in the situation just described it may be considered that signal A indicates "proceed" or "go" while signal R indicates "stop." Thus the vehicle which proceeds along the highway at an excessive rate of speed will be confronted with a signal to stop.

Aspect R will be displayed for a time determined by the adjustment of the cut-out 185, after which time the cut-out 185 will momentarily open the circuit to signal R, magnet 167 will become deenergized, member 163 will move to engage contact 175 instead of contact 181, and the intermittent display of aspect A will be resumed.

STRUCTURE—FIGS. 1, 2, 3 AND 4

(To indicate inadequate speed)

In some instances it may be desirable to utilize this invention to indicate inadequate speed such as, for example, on a so-called "high-speed highway" or in a vehicular tunnel where lagging or slow moving vehicles may cause traffic congestion.

The embodiment of this invention shown in Fig. 1 may be readily adapted for such service by adjustment in the speed at which disc 115 rotates, as well as by adjustment in the length and positioning of the insulated segment 129. As indicated in Fig. 4, the latter adjustment should be such as will cause the disc 115' to come to rest with the initial portion of its insulated segment 129' underlying the contact 131. The length of said segment should be such that it will remain in the path of contact 131 throughout rotation of the disc 115' occurring during what is considered a permissible maximum time between the successive operation of pads 101 and 103.

OPERATION—FIGS. 1, 2, 3 AND 4

(To indicate inadequate speed)

Arranged as just described, vehicles successively operating pads 101 and 103 within less than a predetermined maximum length of time will cause the contact 131 to contact only the insu-

lated segment 129' whereby no change in signal aspect display will occur. Vehicles operating the pads successively within a time longer than said maximum will cause contact 131 to establish a current path through segment 130' and disc 115' for effecting a change in signal aspect display in a manner analogous to that hereinbefore more fully explained.

It will be obvious that the signal aspects displayed by a system as just described may well be altered to give different significant meanings from those referred to in the described arrangement of Fig. 1.

STRUCTURE—FIGS. 1, 2, 3 AND 5

(To indicate both excessive and inadequate speeds)

In some instances it may be desirable to utilize this invention to supervise and assist in maintaining the speed at which an event progresses within fixed limits, i. e., to indicate both excessive and inadequate speed.

For example, assume that a situation arises in which it is desired to supervise the speed of vehicles on a roadway such that the proper or permissive rate of movement for the vehicles will be not less than twelve miles per hour and not more than eighteen miles per hour and such that operation of a vehicle or vehicles at an improper speed will effect display of a signal aspect indicating the character as well as the occurrence of the transgression.

In any such event, the mechanism of this invention may be readily adapted to the desired type of service by making but few alterations.

As best indicated in Fig. 6 the highway pads 101' and 103' are positioned in highway H' and are spaced apart a distance, for example, of eighteen feet, the conductors leading from these pads and their associated magnets corresponding to those already described in connection with Fig. 1.

A disc 115'', similar to disc 115 in Fig. 1 and best indicated in Fig. 5, is arranged to come to rest with the initial end of its conducting portion 130'' underlying contact 131, such portion extending through an angle measured on disc 115'' of approximately two hundred and forty degrees while the insulated portion 129'' extends through the remainder of such disc angle. As described in connection with Fig. 1, disc 115'' is assumed to rotate at a speed of one complete revolution per second.

Three associated contacts 270, 272 and 274 are situated adjacent the periphery of disc 115'' and are adapted to be actuated from one to another position throughout attainment of the rest positioning of disc 115''. During such rest positioning, a cam 276 on the periphery of disc 115'' actuates contact 272 through an insulated member to move said contact away from its biased engagement with contact 270 into engagement with contact 274. Withdrawal of cam 276 pursuant to rotation of disc 115'' will permit contact 272 to assume its bias-urged position in engagement with contact 270.

A conductor 271 extends from contact 270 to that terminal of magnet 165 to which conductor 171 leads in Fig. 1, and conductor 271' leads from contact 272 to contact 131.

Electromagnets 265 and 267 are associated with two contact members 263 and 264. During concurrent deenergization of magnets 265 and 267, member 263 is biased for engagement with a contact 275 and member 264 is biased for disengagement from a contact 281. When one or both of the magnets 265 and 267 is energized, member 263 will be withdrawn from engagement with contact 275 and member 264 will engage contact 281.

Conductors leading from member 163 and contact 181 correspond with like conductors indicated in Fig. 1; however, differing from Fig. 1, a conductor 277 connects contact 175 with contact 275 and a conductor 277' leads from member 263 to a signal lamp C (indicative of correct speed).

Although not shown in Fig. 6, the intermittently closed contacts 139 and 141 of Fig. 1 may, if desired, be included in the conductors 277 or 277' to provide for intermittent display of lamp C.

A conductor 169' (to which conductor 169 of Fig. 1 corresponds in part) leads from supply conductor 149 to members 163 and 264 as well as to one terminal of each of the magnets 165 and 265.

A conductor 274' connects contact 274 with the remaining terminal of magnet 265.

A conductor 281' leads from contact 281 to one terminal of magnet 267, and a conductor 297 connects the remaining terminal of said magnet, through a cut-out 285, with one terminal of a signal lamp S (which lamp may be indicative of inadequate or slow speed).

A conductor 187' leads from the remaining terminal of magnet 167, through a cut-out 185', to one terminal of a signal lamp F (which lamp may be indicative of excessive speed).

The cut-outs 285, 185' may substantially correspond with the cut-out 185 described in connection with Fig. 1.

A conductor 189' connects the remaining terminals of all the signal lamps with supply conductor 147.

Other conductors and parts are substantially identical with those described and indicated in connection with Fig. 1.

OPERATION—FIGS. 1, 2, 3 AND 5

(To indicate both excessive and inadequate speeds)

With structure arranged as described and indicated in Fig. 6 and in the absence of vehicles on the highway H', the disc 115'' will stand at rest, the motor (not shown in Fig. 6) will be operating as described in connection with Fig. 1, all electromagnets will be deenergized and a circuit will be completed for energizing signal lamp C indicative of "clear" or "correct" as referring to the speed of approaching vehicles. Such completed circuit will lead from supply conductor 149 through conductor 169', member 163, contact 175, conductor 277, contact 275, member 263 and conductor 277' to one terminal of signal lamp C, and from the remaining terminal of said lamp through conductor 189' to supply conductor 147.

Assuming now that a vehicle slowly moves along highway H' and operates pad 101'. Disc 115'' will almost instantaneously begin to rotate at a speed of one revolution per second.

If the vehicle is moving at a rate of twelve miles per hour or less, disc 115'' will make one complete revolution and come to rest before the vehicle will traverse the eighteen feet between pads 101' and 103'. As a result, when the vehicle does operate pad 103' the contact 131 will be moved into engagement with the conducting section 130'' of the disc 115'', whereupon an impulse for energizing magnet 265 will pass from supply conductor 147 through conductor 173,

brush 133, disc 115'', section 130'', contact 131, conductor 271', contacts 272 and 274, conductor 274', winding of magnet 265 and conductor 169', to the other supply conductor 149.

Energization of magnet 265 will cause its member 263 to be withdrawn from engagement with contact 275, thus opening the hereinbefore described current path to signal lamp C and terminating the display thereof. In addition, member 264 will move responsive to energization of magnet 265, into engagement with contact 281, thus establishing a current path for the energization of signal lamp S and for holding members 263 and 264 in their attracted positions. Such path leads from supply conductor 149 through conductor 169', member 264, contact 281, conductor 281', winding of magnet 267, conductor 297, inclusive of cut-out 285, to one terminal of signal lamp S, indicative of slow speed, and from the remaining terminal of said lamp through conductor 189' to the other supply conductor 147.

After a desired predetermined time, cut-out 285 will act to open the circuit to lamp S through the winding of magnet 267, thus allowing members 263 and 264 to assume their retracted positions; whereupon the current path hereinbefore described for effecting the display of signal lamp C will be re-established.

A vehicle successively operating pads 101' and 103' while moving at a speed greater than twelve miles per hour but not greatly exceeding eighteen miles per hour, will have no effect upon the signal aspects. In such an event, magnet 145 will be energized within a time following the elapse of two-thirds of, and before the termination of, a full second after the pad 101' was operated. Hence contact 131 will engage only the insulated segment 129'' of the disc 115'', with results as already explained in connection with a similar situation described with reference to Fig. 1.

Now assume that pads 101' and 103' are successively operated by a vehicle moving at a rate substantially faster than eighteen miles per hour. Pads 101 and 103' will both be operated within less than two-thirds of a second that is, before conducting segment 130'' is withdrawn from beneath contact 131, and therefore, since cam 276 of disc 115'' will, at the time, be withdrawn from contact 272 to permit contacts 270 and 272 to form a path from contact 131 to magnet 165 similar to such path described in connection with Fig. 1, the operation of the system will be as described for a like condition, in connection with Fig. 1, in that the signal lamp F (corresponding to lamp R in Fig. 1) will be displayed for a predetermined length of time governed by the adjustment of the cut-out 185' after which time the system will be restored to its "normal" condition.

STRUCTURE—FIG. 7

Under certain circumstances it may be deemed expedient to employ embodiments of this invention which, while differing in character from that indicated in Fig. 1, accomplish more or less analogous results in a substantially similar manner.

A traffic supervising system which so embodies this invention is indicated in Fig. 7, which shows a highway H'' having detector pads 101'' and 103'' as well as signal lamps R', A' and G associated therewith, together with electromagnets 301, 303, 305, 307, 309, 311, 313 and 315. These electromagnets control contacts and may therefore be said to form part of relay mechanisms. Certain of these relays take the place of the cut-out 185 and the motor driven mechanism including the disc 115 of Fig. 1.

Magnet 301 involves a pair of normally open contacts 321 for "quick-action" operation and for closure responsive to energization of said magnet.

Magnet 303 involves a pair of normally open contacts 323 for "ordinary-closing" operation responsive to energization of said magnet and for sufficiently "slow-release" operation (following interruption of energizing current) so that said contacts will open only after they have remained closed long enough to provide for effective energization of another relay.

Magnet 305 involves a center-posed "reed" contact 325 responsive to a closure of minimum duration of the contacts 323 to cause reed oscillation between and for effecting a series of closures with the two interconnected contacts 325' to produce substantially the equivalent effect of a single closure of sustained duration sufficient to assure lighting of signal lamp A' for a desired time, in a manner which will be presently explained in greater detail.

Magnet 307 involves a pair of normally open contacts 327 as well as a contact 327' normally engaging a contact 327'' for operation responsive to energization of said magnet to close contacts 327 and to move contact 327' from contact 327'' to a contact 327'''; this relay mechanism being sufficiently "slow-release" so that said contacts will remain in attracted position throughout circuit interruptions incidental to oscillation of contact 325.

Magnet 309 involves a pair of normally closed contacts 329 as well as a contact 329' normally engaging a contact 329'' for operation responsive to energization of said magnet to open contacts 329 and to move contact 329' from contact 329'' to contact 329'''; this relay being sufficiently "slow-release" so that said contacts will remain in attracted position pending the effective sequential energization of two relays following de-energization of magnet 307, as will be presently explained in greater detail.

Magnet 311 involves a pair of contacts 331 ,open throughout energization of said magnet, and for both slow opening and slow closing operation.

Magnet 313 involves "reed" contacts 333, 333' substantially corresponding with the contacts 325, 325' associated with magnet 305, for assuring that signal lamp R' will be lighted for a desired time, in a manner which will be presently explained in greater detail.

Magnet 315 involves two pairs of normally open contacts 335' and 335'' for "normal-closing" operation responsive to energization of said magnet and for sufficiently "slow-release" following interruption of energizing current so that said contacts will remain in attracted position throughout circuit interruptions incidental to oscillation of contact 333.

The system indicated in Fig. 7 also includes flashing mechanism 337, which may be of any one of various well known types, for causing the lamp G to be intermittently lighted, say 12 to 25 times per minute, while the contact 329' engages the contact 329''.

Current supply conductors 341 and 343, corresponding to conductors 147, 149 of Fig. 1 but preferably leading from a direct current source, are associated with the various electromagnets, detector pads and signal lamps through conductors as follows:

Conductor 345 leads from supply conductor 341 to one terminal of detector pad 101'', conductor 347 leads from the remaining terminal of said pad to one terminal of magnet 301 and conductor 349 leads from the remaining terminal of magnet 301 to supply conductor 343.

Conductor 351 leads from supply conductor 341 to one of the contacts 321, conductor 353 leads from the other of said contacts to one terminal of magnet 303 and conductor 355 leads from the remaining terminal of said magnet to supply conductor 343.

Conductor 357 leads from supply conductor 341 to one terminal of detector pad 103'', conductor 359 leads from the remaining terminal of said pad to one of the contacts 323, conductor 361 leads from the ramaining one of contacts 323 to one of the contacts 329, conductor 363 leads from the remaining contacts 329 to one terminal of magnet 305 and conductor 365 leads from the remaining terminal of said magnet to supply conductor 343.

Conductor 367 leads from supply conductor 341 to the interconnected contacts 325', conductor 369 leads from reed contact 325 to one terminal of magnet 307 and conductor 371 leads from the remaining terminal of said magnet to supply conductor 343.

Conductor 373 leads from supply conductor 341 to contact 329'. Conductor 375 leads from contact 329''' to one of the contacts 327 and conductor 377 leads from the other of said contacts 327 to one terminal of signal lamp A'. Conductor 379 leads from contact 329'' to one terminal of the flasher mechanism 337 and conductor 381 leads from the remaining terminal of said mechanism to one terminal of signal lamp G.

Conductor 383 leads from supply conductor 341 to contact 327'. Conductors 385 and 387 lead from contact 327''' to one terminal of magnet 309 and to one of the contacts 335', respectively. Conductor 389 leads from the remaining terminal of magnet 309 to supply conductor 343 and conductor 391 leads from supply conductor 341 to the other of the contacts 335'. Conductor 393 leads from contact 327'' to one terminal of magnet 311, conductor 395 also leads from said contact 327'' to one of the contacts 331 and conductor 397 leads from the remaining terminal of magnet 311 to supply conductor 343. Conductor 399 leads from the remaining one of the contacts 331 to one terminal of magnet 313 and conductor 401 leads from the remaining terminal of said magnet to supply conductor 343.

Conductor 403 leads from supply conductor 341 to the interconnected contacts 333', conductor 405 leads from the reed contact 333 to one terminal of magnet 315 and conductor 407 leads from the remaining terminal of magnet 315 to supply conductor 343.

Conductor 409 leads from supply conductor 341 to one of the contacts 335'' and conductor 411 leads from the other of said contacts 335'' to one terminal of signal lamp R'. Conductor 413 connects all of the remaining terminals of the various signal lamps R', A' and G with supply conductor 343.

OPERATION—FIG. 7

Based on assumptions that detector pads 101'' and 103'' are spaced apart a distance of six feet, that contacts 323 of electromagnet 303 are adjusted to attain open circuit relationship within one-sixth of a second after the energizing circuit for said magnet is interrupted and that electrical energy of proper character is applied to the various circuits from supply conductors 341 and 343, the arrangement of this invention indicated in Fig. 7 will normally cause an intermittent display of the signal lamp G, but will cause display of signal lamps A' and R' for predetermined lengths of time responsive to successive operation of pads 101'' and 103'' by a vehicle traveling at a speed in excess of twenty-five miles per hour.

In the absence of operation of the detector pads, all of the electromagnets hereinbefore described stand deenergized with the exception of electromagnet 311. Such magnet will be energized through a current path extending from supply conductor 341 through conductor 383, contacts 327'—327'', conductor 393, electromagnet 311 and conductor 397 to supply conductor 343. The signal lamp G will be intermittently displayed through establishment of a current path from supply conductor 341 through conductor 373, contacts 329', 329'', conductor 379, flasher mechanism 337, conductor 381, signal lamp G and conductor 413 to supply conductor 343.

Assume now, for example, that a vehicle approaches and operates the detector pad 101'' while moving at a speed less than twenty-five miles per hour. As detector pad 101'' operates, a current path is established for energizing electromagnet 301 over a circuit including supply conductor 341, conductor 345, pad 101'', conductor 347, electromagnet 301 and conductor 349 to supply conductor 343.

The quick operation of contacts 321, pursuant to energization of magnet 301, establishes an energizing path for magnet 303 from supply conductor 341 through conductor 351, contacts 321, conductor 353, magnet 303 and conductor 355 to supply conductor 343. Such energization of magnet 303 effects closure of the contacts 323 and, since such contacts are adjusted to assume open circuit relationship only after the elapse of one-sixth second following deenergization of magnet 303, these contacts will remain in closed circuit relationship for one-sixth second after the vehicle has ceased to operate pad 101''.

A vehicle moving at the rate of twenty-five miles per hour traverses approximately thirty-six feet in one second or approximately six feet in one-sixth of a second. Since the vehicle is assumed to be now moving at a rate slower than twenty-five miles per hour, it will require more than one-sixth of a second to traverse the distance from pad 101'' to pad 103''. It will be obvious from the foregoing that, before the vehicle reaches the pad 103'', the electromagnet 303 will have become deenergized and its contacts 323 moved to open circuit relationship whereby operation of pad 103'' will be rendered ineffective.

Assume now, for example, that a vehicle proceeds along highway H'' and successively operates the detector pads therein while traveling at a speed of twenty-five miles per hour or greater. The operation of magnets 301 and 303 will be the same as just described in connection with the slow moving vehicle, however, in this instance pad 103'' will be operated before the expiration of the one-sixth second delay of magnet 303 thereby causing an impulse to be sent for the energization of magnet 305 through the path from supply conductor 341 through conductor 357, pad 103'', conductor 359, contacts 323, conductor 361, contacts 329, conductor 363,

magnet 305 and conductor 365 to supply conductor 343.

Energization of magnet 305 will cause its reed contact 325 to produce the effect of a prolonged closure establishing an energizing current path for magnet 307. Such path leads from supply conductor 341 through conductor 367, interconnected contacts 325', reed contact 325, conductor 369, magnet 307, and conductor 371 to supply conductor 343.

The energization of magnet 307 causes its lower movable contact 327' to engage contact 327''' whereupon a current path is established for the energization of magnet 309 from supply conductor 341 through conductor 383, contacts 327', 327''', conductor 385, magnet 309 and conductor 389 to supply conductor 343. Magnet 309 is of the adjustable slow-release type, it requiring in the neighborhood of one-fourth second for it to transpose its contacts to their deenergized position following interruption of the current path through the winding of the magnet.

The energization of magnet 307 also effects closed circuit conditioning of contacts 327.

The energization of magnet 309 effects movement of its contact 329' away from contact 329'' and into engagement with contact 329''', whereupon the circuit heretofore described for intermittent energization of signal lamp G is interrupted and a circuit is established for the energization of signal lamp A' from supply conductor 341 through conductor 373, contacts 329', 329''', conductor 375, contacts 327, conductor 377, signal lamp A' and conductor 413 to supply conductor 343.

Energization of magnet 309 also effects open circuit relationship of contacts 329 whereupon the previously described circuit for energization of magnet 305 is interrupted irrespective of continued operation of the pad 103''.

The contacts of reed magnet 305 may be adjusted to produce the effect of closed circuit conditioning following deenergization for a time considered adequate for the duration of the display of signal A'. For example, such adjustment may effect display of signal A' for a duration of from two to ten seconds after the energizing current path for said magnet is interrupted.

Following resumption of open circuit conditioning of contacts 325, 325', electromagnet 307 will become deenergized, contacts 327 will move to open circuit relationship extinguishing signal lamp A', and contact 327' will be withdrawn from contact 327''' and moved into engagement with contact 327'' thus interrupting the previously described energizing current path for magnet 309. Such interruption of said energizing path will not, however, result in movement of the contacts controlled by magnet 309 to deenergized positioning, for the reason that another energizing path will be established during the "slow-release" period of this magnet, resultant from ensuing energization of magnet 315, as will be presently described in greater detail.

At the time magnet 307 becomes energized and causes contact 327' to be withdrawn from contact 327'', magnet 311 will become deenergized and its contacts 331 will assume closed circuit conditioning.

Responsive to deenergization of magnet 307 with consequent reclosing of contacts 327' and 327'', a momentary impulse for energizing magnet 313 will occur before slow operating magnet 311 will be enabled to effect open circuit conditioning of its contacts 331. Such momentarily effective energizing path for magnet 313 leads from supply conductor 341 through conductor 383, contacts 327', 327'', conductors 393, 395, contacts 331, conductor 399, magnet 313 and conductor 401 to supply conductor 343.

Energization of reed magnet 313 will produce the effect of closed circuit conditioning of contacts 333 and 333' for a prolonged adjustable duration which may be from three to fifteen seconds in length. During such closed circuit relationship a path will be established for the energization of magnet 315 from supply conductor 341 through conductor 403, contacts 333', 333, conductor 405, magnet 315, and conductor 407 to supply conductor 343.

During energization of magnet 315, a path will be completed for re-establishing and continuing the effectiveness of an energizing path for magnet 309, which path leads from supply conductor 341 through conductor 391, contacts 335', conductors 387 and 385, magnet 309 and conductor 389 to supply conductor 343.

It will be recognized that the time elapsing between the separation of contact 327', 327''' and the establishment of the path just described through contacts 335' may be extremely short whereby the slow-releasing magnet 309 will not have sufficient time to effect movement of its contact 329' to its position for engaging contact 329'' before the reenergizing path for magnet 309, as just referred to, is established.

Energization of magnet 315 also effects closure of a current path for the energization of lamp R' from supply conductor 341 through conductor 409, contacts 335'', conductor 411, lamp R' and conductor 413 to supply conductor 343.

Since the energization of magnet 313, and also of course the energization of magnet 315, occurs very shortly after the deenergization of magnet 307, the display of aspect R' will follow immediately after termination of the display of aspect A'.

The display of aspect R' will continue for a time measured by the adjustment of the contacts of the reed magnet 313. Immediately following open circuit conditioning of contacts 333, 333', magnet 315 becomes deenergized, interrupting the path for effecting the display of the aspect R' at contacts 335'' as well as interrupting energization of magnet 309. As magnet 309 permits its contact 329' to withdraw from contact 329''' into engagement with contact 329'', the current path heretofore described for display of aspect G is re-established and contacts 329 again assume a closed relationship rendering pad 103'' conditionable for further effectiveness pursuant to energization of magnets 301 and 303 as heretofore described.

STRUCTURE—FIG. 8

Under some circumstances, it may be found desirable to utilize this invention for a purpose similar to that described in connection with Figs. 1, 6 and 7 but in a slightly different manner. Such a manner of utilization is indicated in Fig. 8 where mechanism embodying this invention is associated with a highway H''' having a single elongated detector pad 102 as well as signal lamps R'', A'' corresponding to similar lamps indicated in Fig. 1.

In the arrangement of Fig. 8, magnets 451, 453, 455, 457 and 459 are associated with a current supply circuit, with the pad 102 and with the various signals to provide a traffic supervising system which is responsive to the duration of an actuation of a circuit controller, instead of being re-

sponsive to the elapse of time between actuations of one and another circuit controller as in the instances of the systems of Figs. 1, 6 and 7. The various electromagnets have diverse operating characteristics as well as diverse contact arrangements, certain of said magnets being adjustable as to said characteristics.

Magnet **451** involves a pair of normally closed contacts **461** adapted to be moved into open circuit relationship responsive to energization of magnet **451**, as well as a contact **463** normally engaging a contact **465** and adapted to be moved out of engagement with said contact **465** and into engagement with a contact **467** pursuant to energization of magnet **451**. This magnet may be termed "quick-acting" in that its contacts assume their various positions immediately following alteration of the energizing current path for the magnet.

Magnet **453** involves a pair of normally open contacts **469** arranged to be moved into closed relationship responsive to energization of magnet **453**.

Magnet **455** involves a pair of normally open contacts **471** adapted to be moved into closed relationship pursuant to energization of magnet **455**.

Both magnets **453** and **455** may be termed "slow-release" in that their respective contacts quickly assume closed circuit relationship responsive to energization of their associated magnets but assume open circuit conditioning only after a preadjusted delay following interruption of the energizing current path for said associated magnets.

Magnets **457** and **459** are associated with a contact member **473**. During energization of one or both of such magnets, contact member **473** will engage a contact **475** and during concurrent deenergization of both of said magnets said member **473** will be in engagement with a contact **477**.

Flashing mechanism **479** is associated with contact **477**. Such mechanism may be of the same character as mechanism **337** heretofore described in connection with Fig. 7.

Cut-out mechanism **481** is associated with contact **475** as will be hereinafter more fully described. Such mechanism may be of a character such as that of mechanism **185** hereinbefore described in connection with Fig. 1.

Current supply conductors **483** and **485**, corresponding to conductors **341** and **343** of Fig. 7, are associated with the various electromagnets, signal lamps and the detector pad through conductors as follows:

Conductor **487** leads from supply conductor **483** to one terminal of the pad **102**, conductor **489** leads from the remaining terminal of said pad to one terminal of magnet **451** and conductor **491** leads from the remaining terminal of said magnet to contact **463**, to one of the contacts **461** and to the supply conductor **485**.

Conductor **493** leads from contact **467** to one terminal of magnet **453** and conductor **495** leads from the remaining terminal of said magnet to its movable contact **469**, to one terminal of magnet **455**, and to supply conductor **483**.

Conductor **497** leads from contact **465** to the remaining terminal of magnet **455**. Conductor **499** leads from the remaining contact **461** to one of the contacts **471**. Conductor **501** leads from the remaining one of contacts **469** to one terminal of magnet **457**, conductor **503** leads from the remaining one of contacts **471** to the remaining terminal of said magnet **457**, and conductor **504** connects contact **473** with supply conductor **483**.

Conductor **505** leads from one terminal of magnet **459** to one terminal of the cut-out mechanism **481** and conductor **507** leads from the remaining terminal of said mechanism to one terminal of signal lamp R''.

Contact **475** is connected to the remaining terminal of magnet **459**. Conductor **509** leads from contact **477** to one terminal of flashing mechanism **479** and conductor **511** leads from the remaining terminal of said flashing mechanism to one terminal of signal lamp A''.

Conductor **513** connects the remaining terminals of said lamps with supply conductor **485**.

The elongated detector pad **102** may be constructed by enlarging the type of pad previously referred to or by arranging a series of parallel connected pads, of the type described in connection with Fig. 1, adjacent one another in such manner that a vehicle, in traversing the pads will effect operation of one before discontinuing operation of a previous one. There may also be substituted for pad **102** equipment of magnetic, photoelectric or sound operated type so long as such equipment effect and maintain a predetermined contact alteration responsive to the presence of a vehicle within a predetermined area.

OPERATION—FIG. 8

Based on assumptions that the effective length of detector pad **102** is four feet, that contacts **469** of electromagnet **453** are adjusted to attain open circuit relationship within one-one hundredth of a second following interruption of the energizing circuit for said magnet, that contact **471** of electromagnet **455** are adjusted to attain open circuit relationship within one-tenth of a second after the energizing circuit for magnet **455** is interrupted and that electrical energy of proper character is applied to the various circuits from supply conductors **483** and **485**, the arrangement of this invention indicated in Fig. 8 will normally cause signal lamp A'' to be intermittently lighted but will cause signal lamp R'' to be lighted for a predetermined length of time responsive to an operation of pad **102** for a time such as that occupied by the passing of a vehicle over said pad at a rate substantially in excess of twenty-five miles per hour.

In the absence of operation of the detector pad, all of the electromagnets hereinbefore described will be deenergized with the exception of electromagnet **455**, which magnet will be normally energized by the current path leading from supply conductor **485**, through conductor **491**, contacts **463**, **465**, conductor **497**, magnet **455**, conductor **495** to supply conductor **483**. Signal aspect A'' will be intermittently displayed through establishment of a current path from supply conductor **483** through conductor **504**, contacts **473**, **477**, conductor **509**, flasher mechanism **479**, conductor **511**, signal lamp A'' and conductor **513** to supply conductor **485**.

Assume now, for example, that a vehicle traverses the detector pad **102** while moving at a speed of twenty-five miles per hour (or less). The resultant operation of the detector pad **102** establishes a current path for energizing electromagnet **451** over a circuit from supply conductor **483** through conductor **487**, pad **102**, conductor **489**, electromagnet **451**, and conductor **491** to supply conductor **485**.

Contacts **461**, **463** will be quickly operated pursuant to the energization of magnet **451**. The heretofore described current path for energizing magnet **455** will be interrupted and contacts **471**

associated therewith will assume open circuit relationship within one-tenth of a second after such interruption. During that time, contact 463 will have moved into engagement with contact 467 thus establishing an energizing current path for magnet 453 from conductor 485 through conductor 491, contacts 463, 467, conductor 493, magnet 453 and conductor 495 to supply conductor 483.

Energization of magnet 453 partially establishes a current path for energization of magnet 457 which path leads from supply conductor 483 through conductor 495, contacts 469, conductor 501, magnet 457, conductor 503, contacts 471 (contacts 471 remaining in closed relationship due to slow-release feature), through conductor 499 to one of the now open contacts 461.

The energization path for magnet 457 as just described will be maintained for substantially one-tenth of a second as governed by the adjustment and functioning of contacts 471. A vehicle moving at twenty-five miles per hour across pad 102 will maintain said pad in its operative condition for approximately one-ninth of a second therefore magnet 455 will permit its contacts 471 to assume open circuit relationship before the vehicle ceases to operate pad 102 and thereby permits deenergization of magnet 451 so that ensuing occurrence of such deenergization will have no effect upon any of the circuits other than to re-establish energization of magnet 455 as described.

Now assume that the vehicle proceeding along the highway H''' traverses the pad 102 at a speed greater than twenty-five miles per hour, such as, for example, thirty miles per hour. In this instance, the duration of operation of pad 102 will be but for approximately one-eleventh of a second. The operation of the various magnets will be as just described up to and including the partial establishment of the energizing current path for magnet 457. As the faster moving vehicle will operate the pad 102 for but substantially one-eleventh of a second and while the electromagnet 455 will maintain its contacts 471 in closed relationship for one-tenth of a second following interruption of its energizing current path, it will be obvious that, before contacts 471 open, magnet 451 will become deenergized and thus allow its contacts 461 to close during closure of contacts 471 as well as during closure of contacts 469 (contacts 469 remaining closed one-one hundredth of a second after deenergization of magnet 451). As a result, an impulse of substantially one-one hundredth of a second for energizing magnet 457 will be sent over a current path leading from supply conductor 483 through conductor 495, contacts 469, conductor 501, magnet 457, conductor 503, contacts 471, conductor 499, contacts 461, and conductor 491 to supply conductor 485.

Energization of magnet 457 will cause contact 473 to be moved into engagement with contact 475 thus interrupting the previously described current path for effecting display of signal aspect A'' and will establish a path for effecting display of aspect R'' and, incidentally, for causing contact 473 to be maintained in engagement with contact 475. Such path leads from conductor 483 through conductor 504, contacts 473, 475, magnet 459, conductor 505, cut-out mechanism 481, conductor 507, lamp R'', and conductor 513 to supply conductor 485.

The display of aspect R'' will continue for a time determined by the adjustment and operation of cut-out 481. Upon interruption of the current path to aspect R'' by operation of cut-out mechanism 481, magnet 459 will become deenergized thus permitting contact 473 to re-establish the current path for display of aspect A''. Display of aspect R'' will now be terminated and the various magnets will, by this time, assume their normal conditions and will be awaiting further operations of pad 102 for the determination of excessive rate of movement of another vehicle along the highway H'''.

The arrangements and embodiments of this invention as indicated in Figs. 7 and 8 have been directed to their utilization for the determination of excessive rates of movement. Those skilled in this art will recognize that the arrangements disclosed by Figs. 7 and 8 may be readily altered in a manner corresponding to that shown in Figs. 1–4 and/or Fig. 6 for utilization to indicate inadequate rates of movement and/or inadequate and excessive rates of movement.

Furthermore, in the foregoing description and in the drawings, the adjustments of magnets, the spacing and/or length of detector pads, the speed of operation of mechanism, the vehicle speeds and the signal aspect indications have all been based upon assumptions adopted as a matter of convenience to facilitate description and illustration of this invention and any one, any group or all of the assumed values, characteristics and arrangements may be altered in diverse ways without detracting from the results obtained or departing from the scope of this invention.

The foregoing descriptions have been, for the most part, based upon certain of the embodiments of this invention which are particularly suited for utilization in connection with the supervision of vehicular traffic movements along highways. Furthermore, it will be evident that this invention might have been illustrated in the accompanying drawings as embodied in any one of many different kinds of mechanisms. Those embodiments which have been selected for use as illustrative of the invention have been chosen as a matter of convenience, and not because they exhaust the scope of the invention in its application to the various uses for which it is suited. Furthermore, it should be remembered that various features of this invention may be advantageously utilized singly or in groups containing less than all of said features.

The explanations hereinbefore given as to illustrative embodiments of this invention, when considered in connection with the accompanying drawings, are believed to be fully sufficient to enable those skilled in this art to readily apply this invention to all situations to which it is suited.

Claim is made to, and it is desired to secure by Letters Patent of the United States of America, all generic and specific features of the invention indicated by the accompanying drawings, and as hereinbefore more fully described, including all features which may, as a matter of language, be said to fall between the scope of any of the following.

I claim:

1. A signal system for indicating the speed of traffic along a prescribed path having, in combination, a group of vehicle detector mechanisms associated with said path and adapted to be successively operated pursuant to the progress of a vehicle along such path, "correct," "fast" and "slow" signal indications, means normally effecting display of said "correct" indication,

means involving said detector mechanisms for terminating the display of said "correct" indication and for effecting display of said "fast" indication responsive to operation of the detector mechanisms of said group at a higher than a predetermined frequency and for terminating the display of said "correct" indication and for effecting display of said "slow" indication responsive to operation of the detector mechanisms of said group at a lower than a predetermined frequency, and means restoring normal display of said "correct" indication following timed presentation of one of the other of said indications.

2. A signal system for indicating the speed of traffic along a prescribed path having, in combination, a group of vehicle detector mechanisms associated with said path and adapted to be successively operated pursuant to the progress of a vehicle along such path, "correct," "fast" and "slow" signal indications, means normally effecting display of said "correct" indication, and means involving said detector mechanisms for terminating the display of said "correct" indication and for effecting display of said "fast" indication responsive to operation of the detector mechanisms of said group at a higher than a predetermined frequency and for terminating the display of said "correct" indication and for effecting display of said "slow" indication responsive to operation of the detector mechanisms of said group at a lower than a predetermined frequency.

3. A traffic signaling apparatus for indicating characteristics of the rate-of-movement of traffic along a vehicular highway having, in combination, an "excessive" signal indication, an "inadequate" signal indication, and a normally displayed "permissive" signal indication, said indications representative of the rate-of-movement characteristics of traffic on said highway, a traffic actuatable controller, and traffic responsive means associated with said controller and with said highway for rendering said indications representative of the rate-of-movement characteristic of traffic on said highway.

4. A highway traffic signal system including a pair of signal circuits, one circuit including a signal to indicate "stop" and the other to indicate "go," switching means normally maintaining the "go" signal circuit closed and the "stop" signal circuit open and movable through a cycle to first reverse and then restore to normal the circuit conditions, normally inactive time controlled means for moving said switching means through its cycle, vehicle actuated means situated in the highway, and means responsive only to such operation of said vehicle actuated means as effected by a vehicle progressing along said highway at a rate of speed exceeding a predetermined maximum for rendering active said time controlled means.

5. In a signaling device for indicating deviations from a preselected rate of movement of an object having in combination a plurality of detector mechanisms operable for effecting circuit changes separated by time intervals dependent upon relative movement between said mechanism and the moving object, a revolvable member, a driving motor, means normally operative to hold the revolvable member in a stationary position and releasable upon the effecting of a change in the circuit conditioning of one of said detector mechanisms to permit the motor-controlled movement of said member, an electrical contacting member, means for actuating said contacting member responsive to a change in the circuit conditioning of another of said detector mechanisms, a signal for indicating an excessive rate of movement of said object relative to said detector mechanisms, a signal circuit for operating said signal and capable of being established upon actuation of said contacting member, and means associated with the revolvable member for preventing the establishment of the signaling circuit providing the revolvable member has been rotated through more than a predetermined portion of its cycle before the contacting member is actuated.

6. In a signaling device for indicating deviations from a preselected rate of movement of an object having in combination a plurality of detector mechanisms operable for effecting circuit changes separated by time intervals dependent upon relative movement between said mechanism and the moving object, a revolvable member, a driving motor for said member, means normally operative to hold the revolvable member in a stationary position and releasable upon the effecting of a change in the circuit conditioning of one of said detector mechanisms to permit the motor-controlled movement of said member, an electrical contacting member, means for actuating said contacting member responsive to a change in the circuit conditioning of another of said detector mechanisms, a signal for indicating an inadequate rate of movement of said object relative to said detector mechanisms, an electrical switch associated with the revolvable member and permitted to assume an open position by the said revolvable member during a predetermined part of its motor-controlled movement, and means for rendering said signal responsive to actuation of the said contacting member after the closure of said electrical switch.

7. In a timing device for detecting variations in the deviation of the duration of an event from a preselected minimum duration of time, the combination of a timing motor, a revolvable member rotated thereby, means operative to retain said member in a stationary position and releasable at the beginning of said event to permit the motor-controlled movement of said member through a predetermined cycle, a second means operated at the expiration of the duration of said event, means desired to be operated if the duration of said event is less than a predetermined minimum extent of time, an electric circuit for effecting operation of the last mentioned means, a movable member operable by the said second means for controlling said circuit, and means associated with said revolvable member for rendering said circuit unresponsive to operation of the movable member after the revolvable member has rotated through a predetermined portion of its cycle.

8. In a timing device for indicating deviations from a predetermined extent of time, a timing motor, a revolvable member rotated thereby, means operative to retain said member in a stationary position and releasable at the beginning of the said extent of time to permit the motor-controlled movement of said member through a predetermined cycle, a second means operated at the expiration of said interval of time, an electric signaling circuit desired to be energized if the said extent of time is less than or more than a predetermined duration, a movable member operated by the second means for closing said circuit, and means associated with the revolvable member for preventing the closing of said circuit if the movable member is operated during a prede-

termined portion of the movement of the revolvable member.

9. In a timing device for detecting variations in the duration of an event from a preselected maximum duration of time, the combination of a timing motor, a revolvable member rotated thereby, means for retaining said member in a stationary position and releasable at the beginning of said event to permit the motor-controlled movement of said member, a second means operated at the expiration of the duration of said event, means desired to be operated if the duration of said event is longer than a predetermined maximum, and means for rendering said last mentioned means inoperative upon operation of the second means during a predetermined extent of the rotation of the revolvable member.

10. In a timing device for detecting variations in the duration of an event from a preselected maximum duration of time, the combination of a timing motor, a revolvable member rotated thereby, means operative to retain said member in a stationary position and releasable at the beginning of said event to permit the motor-controlled movement of said member, a second means operated at the expiration of the duration of said event, means desired to be operated if the duration of said event is more than a predetermined maximum extent of time, an electric circuit for effecting operation of the last mentioned means, a movable member operable by the said second means for controlling said circuit, and means associated with said revolvable member for rendering said circuit unresponsive to operation of the movable member unless the revolvable member has rotated through a predetermined portion of its cycle.

11. In a timing device for detecting variations in the duration of time, the combination of a timing motor, a revolvable member rotated thereby, means for retaining said member in a stationary position and releasable at the beginning of said event to permit the motor-controlled movement of said member through a predetermined extent of rotation, a second means operated at the expiration of the duration of said event, a relay, means effective for energizing said relay upon operation of said second means during a predetermined initial part of the rotation of said revolvable member but ineffective for energizing the relay upon operation of the second means after the revolvable means has been rotated farther than the said initial part of its rotation, a holding circuit for said relay, and timing means for releasing said holding circuit a predetermined time after the relay is energized.

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