May 11, 1943. O. KITCHEN 2,319,137

AUTOMATIC RAILROAD CROSSING SIGNAL

Filed June 12, 1940 2 Sheets-Sheet 1

FIG. 1.

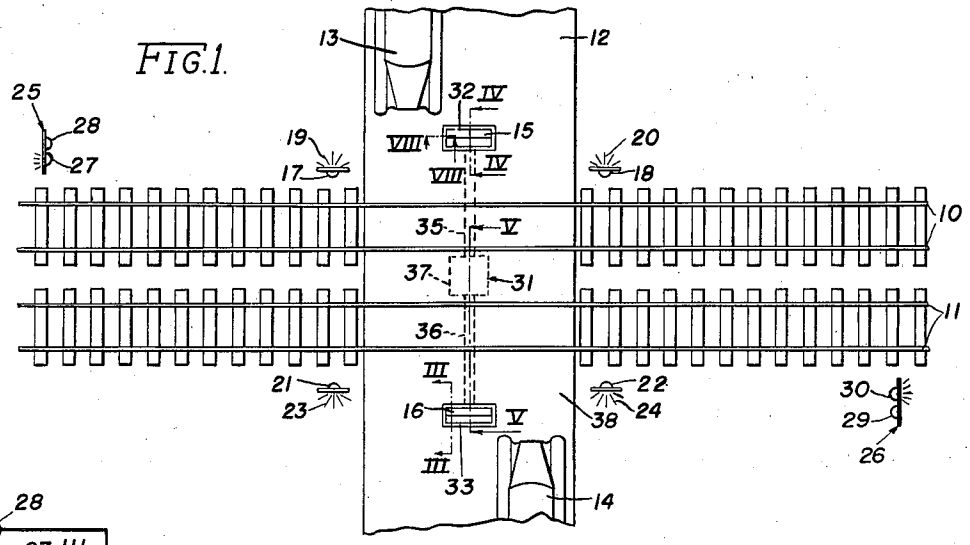


FIG. 2.

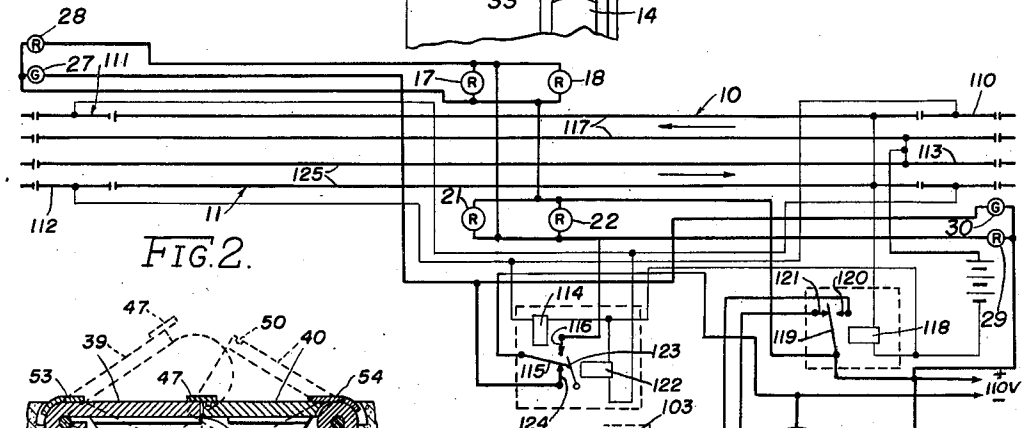


FIG. 3.

FIG. 4.

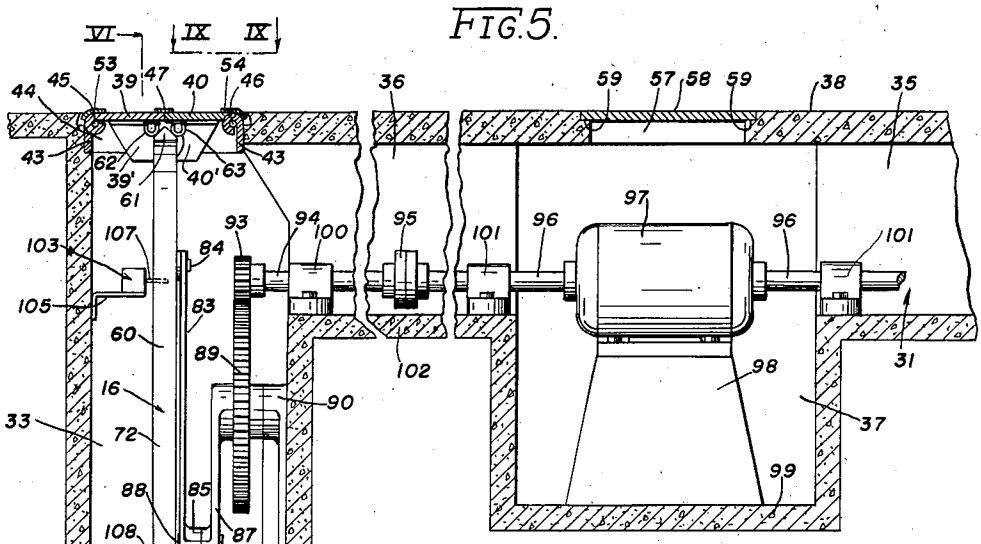
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FIG. 5.



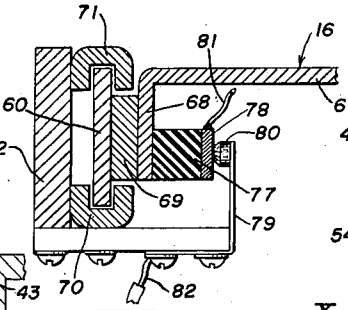


FIG. 7.

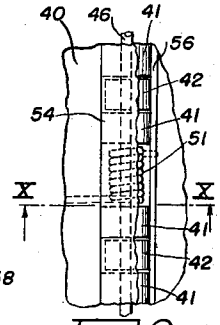


FIG. 9.

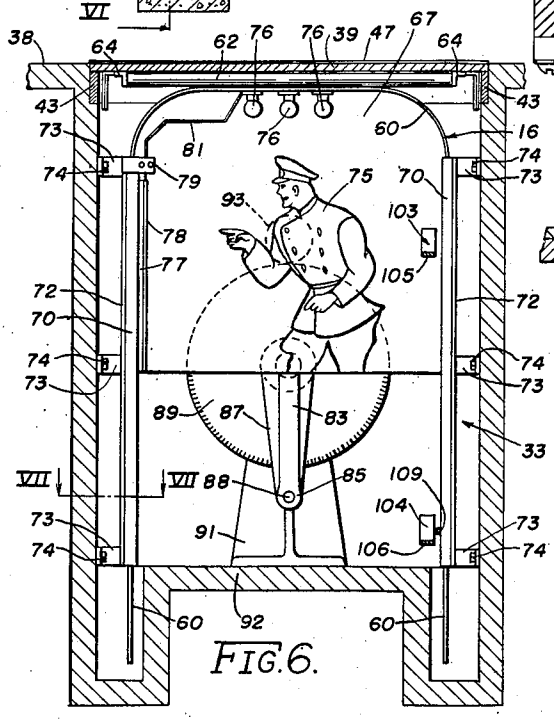


FIG. 6.

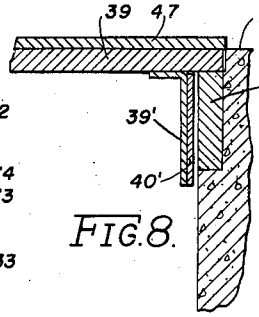


FIG. 8.

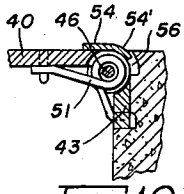


FIG. 10.

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2,319,137

AUTOMATIC RAILROAD CROSSING SIGNAL

Otis Kitchen, Chicago, Ill.

Application June 12, 1940, Serial No. 340,110

1 Claim. (Cl. 246—129)

This invention relates to safety devices for railroad crossings and more particularly to improved crossing safety signals actuable by approaching trains for positioning in the path of vehicle travel along intersecting roads.

It contemplates more especially the provision of improved railroad crossing signal devices that serve as a partial obstruction to normal vehicular travel along roads intersecting with railroads to enforce a stop without completely obstructing emergency passage.

Numerous signal devices have heretofore been proposed to indicate approaching trains to drivers of vehicles travelling along an intersecting roadway. For the most part, known signals either embody indicators that have no obstructing effect on vehicular travel or completely obstruct the railways so that vehicular passage is rendered hazardous or impossible in the event the signals should become inoperative or the driver of the approaching vehicle does not have sufficient time to clear the signal owing to his position of approach at the time of signal operation.

With the teachings of the present invention, it is proposed to combine the advantageous features of both non-obstructing and complete-obstructing railway signals and crossing gates. To this end, signal means have been provided which respond to approaching trains to occupy a position in the roadway that substantially obstructs passage of vehicles on both sides of the road unless extreme care is exercised to effect clearance therewith in the event the signal operating mechanism should become inoperative or the driver of an approaching vehicle is so close to the signal at the time it moves to an operative position that avoidance thereof as well as the approaching trains becomes essential. This is important at remote crossings where attendants are not justified and still there is a marked requirement for an effective signal which will prevent collisions between trains and vehicles travelling along intersecting paths.

In such situations, automatic gates and crossing barriers are not entirely satisfactory in that oncoming vehicles may be too close to avoid stopping in front of the gates or other obstruction and yet have sufficient clearance to avoid collision with the approaching train had there been an effective signal alarm serving to inform the approaching motorists. Then, too, ordinary non-obstructing signals are not satisfactory in that drivers of vehicles are not always responsive thereto in view of apparent clearance for travel across the rails with the thought that a collision can be avoided. Consequently, the known crossing signals of the non-obstructing and complete-obstructing types are not entirely effective unless there is an attendant at the crossing.

One object of the present invention is to simplify the construction and improve the operation of devices of the character mentioned.

Another object is to provide an improved railway crossing signal that is partially obstructing to vehicular travel and yet permits passage therearound by exercising due care when the signal mechanism should become inoperative or the approaching vehicle is so close to preclude a stop and yet afford avoidance with the approaching train.

Still another object is to provide an improved automatic railway crossing signal that is partially obstructing to vehicular travel responsive to approaching trains and yet permits passage therearound by exercising due care when the signal mechanism should become inoperative or the approaching vehicle is so close as to preclude a stop and yet afford avoidance with the approaching train.

A further object is to provide a railway crossing signal mechanism that rises into the intersecting roadway to obstruct the center lane thereof and permit vehicle clearance therearound with the exercise of due care.

A still further object is to provide a railway crossing signal mechanism of a partially obstructing type that automatically rises into the tersecting roadway to obstruct the center lane thereof and permit vehicle clearance therearound with the exercise of due care.

Still a further object is to provide an improved and simplified railway crossing signal responsive to approaching trains that partially obstructs a vehicle travelling roadway and provides an indicator to the approaching train as to the operation or inoperation of the roadway signal after the crossing has been traversed.

Other objects and advantages will appear from the following description of an illustrative embodiment of the present invention.

Figure 1 is a diagrammatic plan view of an intersecting railway crossing showing signal means embodying features of the present invention.

Figure 2 is a schematic view of a wiring diagram for a railway crossing signal system embodying features of the present invention.

Figure 3 is a fragmentary sectional view taken substantially along line III—III of Figure 1, parts thereof being shown in dotted outline in advanced position of operation.

Figure 4 is a fragmentary elevational view taken substantially along line IV—IV of Figure 1, parts thereof being shown in dotted outline in advanced position of operation.

Figure 5 is a sectional view in elevation of an actuating mechanism with the signal shown concealed in their tunnel compartments taken substantially along line V—V of Figure 1.

Figure 6 is a fragmentary sectional view taken substantially along line VI—VI of Figure 5.

Figure 7 is a fragmentary sectional view of a gate illuminator control switch taken substantially along line VII—VII of Figure 6.

Figure 8 is a fragmentary sectional view taken substantially along line VIII—VIII of Figure 1.

Figure 9 is a fragmentary plan view of gate cover hinge viewed substantially from line IX—IX of Figure 5.

Figure 10 is a fragmentary sectional view of a hinge taken substantially along line X—X of Figure 9.

The structure selected for illustration embodies the customary double railway tracks 10 and 11 which intersect with a highway, street or grade crossing 12 along which vehicles such as automobiles 13 and 14 travel in opposite lanes intersecting with the railway tracks 10—11. In the present embodiment, signal arches 15 and 16, in this instance two, are disposed within the roadway 12, these being of sufficient width to transversely occupy a space that will preclude the double lane travel of vehicles 13 or 14 in the same direction and partially obstruct single lane travel of the vehicles 13—14 unless extreme care is utilized in passing to one side or the other of the signal arches 15—16 depending upon the direction of the oppositely travelling vehicles 13—14.

It should be observed that the signal arches 15—16 are substantially the width of a standard vehicle 13 or 14 so as to occupy the center lane of a three-lane roadway 12 while on four-lane roadways the signal arches 15—16 preferably though not essentially should be of double width to permit only a single restricted lane of travel in both directions for reasons which will appear more fully hereinafter. It will be observed, therefore, that the transverse extent or space occupied by the signal arches 15—16 will depend largely upon the width of the roadway 12 or otherwise as commercial practice may dictate to procure the most effective signal results.

In addition to the signal arches 15—16, auxiliary illuminator signals 17—18 are erected on both sides of the roadway 12 proximate to the track 10 so that preferably red light rays 19 and 20, respectively, will emanate therefrom toward the approaching vehicle 13. A similar pair of auxiliary illuminator signals 21 and 22 are erected on both sides of the roadway 12 proximate to the track 11 so that preferably red light rays 23 and 24, respectively, will emanate therefrom toward the approaching vehicle 14. It should be noted that the illuminator signals 17—18 and 21—22 may be of an audible type or an audible signal may be combined with the illuminating signals 17—18 depending upon the requirements or dictates of commercial practice.

An additional set of illuminator signals 25 and 26 each comprising, in this instance, a set of two lights 27—28 and 29—30, respectively, are mounted adjacent the side of the tracks 10—11, respectively, at an appreciable distance from the roadway 12 to emanate light in the direction of train travel so that the attendants can determine therefrom whether or not the signal arches 15—16 together with the illuminated signals 17—18 and 21—22 are in proper operation as the train travels beyond the roadway 12.

From these illuminator signals 27—28 and 29—30 which are each preferably though not essentially green and red, respectively, the attendants on the trains passing beyond the roadway 12, can determine whether or not the signals 15—16, 17—18, and 21—22 have operated properly and returned to their initial position of inoperation so that a report can be made at the next train stop as to the operation of the signals along the entire railway system. The operation of these various signals are entirely automatic and will appear more fully from a description of the circuit.

In order to accommodate the signal arches 15—16 as well as the actuating mechanism therefor, an elongated pit 31 is preferably excavated longitudinally along the roadway 12 and across the tracks 10—11 to provide substantially rectangular chambers 32 and 33 which communicate through passages 35 and 36 to a chamber 37 (Figure 5) that serves as a power source for actuating both signal arches 15—16. The elongated cavity 31 with their chambers 32—33—37 and their communicating passages 35—36 are preferably lined with waterproof walls of any suitable material such as concrete to maintain them relatively water-tight in conjunction with the roadway top surface 38 constructed from similar material.

To this end, the signal arch receiving chambers 32—33 of identical construction are each provided with confronting cover plates 39 and 40 that terminate in a plurality of hinge loops 41 (Figure 9) that are spaced to receive complemental hinge loops 42 (Figures 9 and 10) comprising an integral part of a substantially rectangular opening liner 43 which is anchored to and occupies an opening 44 provided in the roadway crossing surface 38 above the cavities 32 and 33 (Figure 5). Hinge pintles 45 and 46 extend through the aligned hinge loops 41—42 that pivotally connect the closure plates 39—40 to permit them to swing upwardly to permit the elevation of the signal arches 15—16 from the chambers 32—33.

In order to render the closure plates 39—40 substantially water-tight and to effectively close the openings 44 above the signal arch chambers 32—33, a steel plate 47 is welded proximate to the edge of the closure plate 39 (Figure 4) to overlap the top surface thereof and contact the edge regional surface of the confronting closure plate 40. It should be noted that the closure plates 39—40 are somewhat spaced from each other to present a clearance space 48 that is covered by the plate 47 that also overlaps an elongated slot 50 provided in the adjacent surface proximate to the end edge of the other closure plate 40 to preclude the entrance of foreign substances and provide a drain along the slot 50 which will avoid any deposits in any event on the signal arches 15—16. End plates 39'—40' are attached to the side edges of closure plates 39—40. The plate 39' has a rounded edge 39'' and plate 40' has a square end 40'' which is overlapped by the rounded end 39'', thereby permitting the smooth opening of both closure plates 39—40. The side covers 39'—40' tend to prevent dust, snow or rain from blowing into pit through the ends of the closure plates 39—40 when in their fully open position.

So that closure plates 39—40 will be closed in response to their own weight as well as by the

urge of springs, coil springs 51 envelop the hinge pintles 45—46 between the hinge loops 41 to exert a closing urge on the closure plates 39—40 auxiliary to the gravity urge thereon. To preclude the pintles 45—46 from axial displacement from the hinge loops 41—42, threaded studs 52 (Figure 4) extend through one of the hinge loops 42 proximate to the end of the doors to engage the pintles 45—46 and preclude their rotative axial displacement. Suitable hinge cover plates 53 and 54 are welded or otherwise secured to the closure plates 39—40 to extend over the integrally associated hinge plates 41 to provide an overlapping protective cover precluding the access of foreign substances and water therethrough.

To this end, the hinge cover plates 53—54 terminate in arcuate extensions 53'—54' to enter correspondingly shaped arcuate recesses 55 and 56 formed in the adjacent region of the roadway surface 38 to accommodate the hinge cover plates 54 when the closure plates 39—40 have been opened responsive to elevating the signal arches 15—16 as will appear more fully hereinafter. It should be noted that proper water drains are provided in the chambers 32—33—37 to eliminate any moisture or water that may collect therein.

In order to enable access to the instrumentalities confined in the central chamber 37 of the pit 31, an opening or man-hole 57 is formed of sufficient size in the road surface 38 to permit an attendant to pass therethrough for access for repair, replacement or other purposes incident to the maintenance thereof. A metallic man-hole cover 58 rests upon shoulders 59 formed along the pheriphery of the man-hole 57 to serve as a support for the cover 58 that has its top surface in alignment with the surface of the roadway 12—38. It will be apparent, therefore, that the pit 31 will be effectively protected against the entrance of moisture, precipitation, or foreign substances that would impair the operation of operating instrumentalities to be hereinafter described.

The signal arches 16 comprise substantially rectangular metallic angle iron frames 60 which terminate upwardly in a pointed top member 61 extending thereacross, the top member 61 preferably being of triangular cross-section to cooperate with confronting rollers 62 and 63 journalled in brackets 64 and 65, respectively. The roller brackets 64—65 are attached to the underside of the closure plates 39—40 proximate to their confronting edges for positioning in the path of the signal arches 16 so that the converging surface of the top member 61 is disposed in the path thereof to elevate the closure plates 39—40.

It should be noted that the top linear edge 66 of the triangular top member 61 is in alignment with the clearance space 48 to normally extend between the closure plates 39—40 so that actual contact therewith is precluded by virtue of the wedging action on the closure plate rollers 62—63 that traverses the converging sides of the top member 61 and continues to contact the edges of the signal frame 60 as the signal arches 15—16 are elevated responsive to instrumentalities to be hereinafter described (Figure 4).

This will serve to automatically open the closure plates 39—40 that normally close the signal arch confining chambers 32—33. As the signal arches 15—16 recede for confinement within the chambers 32—33, the closure plates 39—40 will touch each other responsive to the urge of gravity and the hinge springs 51. A metallic sheet 67 serves as a back for the signal arch frame 60, it having an angularly offset peripheral flange 68 that is attached to side spacer bars 69 anchored to the signal arch frame 69 (Figure 7) to enable confinement of the latter in confronting guide brackets 70 and 71 disposed at both ends of the signal arch chambers 32—33.

The confronting guide brackets 70—71 are fixed to vertical plates 72 that are in turn supported in spaced relation to the ends of the central arch chambers 33 by means of a plurality of brackets 73, in this instance three, mounted along each end wall thereof for attachment thereto by means of suitable fasteners 74. A suitable figure such as a facsimile of a policeman 75 is preferably attached to the back plate 67 of the signal arch frame 60 to serve as a stop indicator illuminated by one or more lights 76, in this instance three, fixed to the underside of the top edge of the signal arch frame 60 (Figure 3).

These lights become energized as the signal arches 15—16 are elevated into operative position to serve as a partial obstruction in the roadway 12 when displaced from its initial inoperative position of confinement within the two chambers 32—33 as will appear more fully hereinafter. So that the illuminating lights 76 will become energized responsive to the elevation of the signal arches 15—16, the frames 60 thereof are provided with an insulator block 77 fixed to the side flange 68 of the back plate 67 (Figure 7) to mount an elongated conductor plate 78 thereon.

A terminal 79 carries a contact 80 in the path of the conductor plate 78 so as to effect contact therewith as the signal arches 15—16 are partially elevated and continue in their vertically upward displacement to their maximum operative position above the surface of the roadway 12. As the signal arches 15—16 recede into their respective pit chambers 32—33, the switch terminal contact 80 rides off of the conductor 78 to break the circuit to the illuminators 76. Suitable lead wires 81 and 82 extend from the conductor plate 78 and switch terminal 79, respectively, to a source of energy (not shown) so that the illuminator 76 will be automatically responsive to the position of the signal arches 15—16.

The signal arches 15—16 are elevated and lowered by means of links 83 that are pivoted as at 84 to the back plate 67 along a vertical median line thereof. The links 83 terminate in an apertured boss 85 that confronts a similar boss 86 formed on a crank arm 87 to receive an interconnecting pintle 88 therethrough. The crank arm 87 is fixed to a shaft which rotates with a spur gear 89, the mounting shaft thereof being journalled in a bearing bracket 90 that has a depending standard 91 resting upon the floor 92 of the signal arch chambers 32—33.

The spur gear 89 meshes with a pinion 93 that is carried by a shaft 94 terminating in a coupler 95 which is operatively connected to double armature shafts 96 of an electric motor 97. The electric motor 97 is mounted on a pedestal 98 fixed to the floor 99 of the central pit chamber 37. The shafts 94—96 are journalled in bearing brackets 100 and 101 fixed to the floor 102 of the communicating pit passages 35—36 for journalled support of the shafts 94—96 in horizontally spaced relation therewith. It will be observed, therefore, that with the rotation of the motor 97, the signal arches 15—16 will be ele-

vated to their operative position and then returned to their inoperative position for total confinement in the pit chambers 32—33 responsive to controls that will be more particularly described hereinafter in connection with the schematic wiring diagram.

In order to control the operation of the motor 97 so that the signal arches 15—16 will be elevated and lowered to their extreme positions and the motor 97 rendered inoperative in consequence thereof, limit switches 103 and 104 are supported in the signal arch chambers 32—33 by means of brackets 105—106, respectively. The brackets 105—106 are anchored to the wall of the pit chambers 32—33 to present upper and lower resilient limit switch contacts 107 and 108 in the path of a trip 109 fixed to the side wall of the signal arch frame 60.

The resilient limit switch contacts 107—108 together with the trip 109 are in the circuit with the electric motor 97 to effect the energization and de-energization thereof for operation of the signal arches 15—16 automatically responsive to the approach of trains travelling on tracks 10 and 11. It will be observed that the tracks 10 and 11 are each provided with insulated track sections 110—111 on both sides of the roadway 12 on track 10 and on both sides of the roadway 12 on track 11, respectively, at predetermined positions of approach at any suitable distance from the roadway 12 depending upon the speed of travel of the train and the timing of the signal arches 15—16.

Similarly, insulated sections 112 and 113 are provided on both sides of the roadway 12 on the track 11 at a corresponding distance on the opposite side of the roadway 12 to control the operation of the electric motor 97 together with the auxiliary light signals 17—18 and 21—22 as well as the green-red sets of signals 27—28 and 29—30 positioned for observance so that the attendants on the trains passing beyond the roadway 12, can determine whether or not the signals 15—16, 17—18 and 21—22 have operated properly and return to their initial position of inoperation. The insulated track sections 110—111 and 112—113 in tracks 10—11, respectively, will control the operation of the electric motor 97 and the signal arches 15—16 responsive to trains approaching in the direction of the arrow on track 10 and in the opposite direction indicated by the arrow on track 11.

The control circuit schematically shown in Figure 2 is arranged so that a train passing on insulated track sections 110 on track 10 will have its wheels bridge across these rails and close the low potential signal circuit to energize a coil 114 comprising a locking relay. The locking relay 114 closes switch contacts 115—116 to energize the signals comprising red lights and/or bells 17—18 and 21—22 together with the operating indicator red-green lights 29—30. As the train passes on to the next rail section 117, a coil 118 of a contactor switch is energized to close switch contacts 119—120. This starts the electric motor 97 which elevates the signal arches 15—16 on both sides of the tracks 10—11.

It should be noted that as the signal arches 15—16 start to rise, the signal arch trip 109 rides off of the spring terminal 108 to close the lower limit switch 104. As the signal arches 15—16 reach their maximum upward position of displacement, the signal arch trip 109 engages the spring contact 107 to open the upper limit switch 103. This deenergizes and stops the motor 97. As the train proceeds beyond the crossing and passes off the insulated section 117 and onto track section 111, the coil is deenergized and contacts 119—120 open while simultaneously closing contacts 119—121 of this double acting relay switch 118. This again starts the motor 97 to lower the signal arches 15—16 until the signal arch trip 109 engages the lower limit switch contact 108 and opens the lower limit switches 104 to deenergize the motor 97.

As the train crosses beyond track section 111, an unlocking relay coil 122 is energized to unlock the switch contacts 115—123 and allow contacts 115—116 to open and close contacts 115—124. This turns off the crossing lights 17—18 and 21—22 while turning on the green train attendant indicator lights 27 and 29. This evidences that the cycle of operations has been completed to the attendants on the passing train. It should be noted that the attendant indicator lights 27—28 and 29—30 may be controlled directly responsive to the operation of the signal arches 15—16 or the electric motor 97 in much the same way as the auxiliary signal lights 17—18 and 21—22. The light circuit lines (Fig. ure 2) are the signal circuit which preferably carry a potential of 6 to 12 volts A. C. or D. C. while the heavy lines are the power circuit and preferably carry a potential of 110 volts A. C. or D. C. or any other suitable voltage.

The cycle of operations described in connection with the approaching trains travelling in the direction indicated by the arrow on track 10 is identical with the cycle of operations initiated by a train or trains traveling in the direction of the arrow on track 11 in that its track sections 112, 125, 113 are connected in parallel with track sections 110, 117, 111 of track 10.

With the arrangement of parts above described, the signal arches 15—16 comprise a fractional part of the roadway 12 so that they will obstruct all travel of vehicles 13—14 on all lanes thereof except single outside edge lane. Consequently, when the signal arches 15—16 are elevated to their maximum upward limit, they will partially obstruct the roadway 12 and serve as a substantial indicator causing all vehicular travel to be observant thereof and exercising care to avoid collision therewith. This effectively serves to stop all motorists and respond to the signals 15—16, 17—18 and 21—22.

With the allowance of single outside edge lanes, however, the vehicles 13—14 can still cross over the tracks 10—11 in the event the signal arches 15—16 should remain inoperative in their extreme upward position or should vehicles 13—14 be over any part of the signals 15—16 at the time they start to operate responsive to approaching trains and tracks 10 and/or 11. If the signal arches 15—16 were extended for the full width of the roadway 12, there would be situations wherein motorists would find themselves unable to avoid collision with the usual gates that obstruct the full width of the roadways 12. This would be equally hazardous with the usual light and bell signals that merely indicate an approaching train without serving as as an obstruction to the path of vehicular travel. Under such circumstances, the drivers of the vehicles 13—14 are inclined to beat the train to the crossing and as a result such signals have not served any real effective purpose.

Various changes may be made in the embodiment of the invention herewith specifically de-

scribed without departing from the invention or sacrificing any of the advantages or features thereof, and nothing herein shall be construed as a limitation of the invention, its structural concept or embodiment as to the whole or any part thereof, except as defined in the appended claim.

I claim:

In a device of the character described, the combination with a roadway of predetermined width, there being a pit in said roadway on either side of railway tracks intersecting said roadway, rigid signal members mounted along a longitudinal median line of said roadway, said signal members characterized by a dimensional width that conforms to a fractional part of the roadway width to obstruct all lanes of vehicle travel except single outside edge lanes conforming substantially to the standard width of a vehicle, and hinged closure plates over the top opening of said pit, rollers depending from said hinged closure plates in the path of said rigid signal members to effect contact therewith for operation responsive to the vertical displacement of said rigid signal members.

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