April 10, 1928.

R. O. NELSON

1,665,560

VARIABLE TRAFFIC SIGNAL

Filed May 16, 1925

2 Sheets-Sheet 1

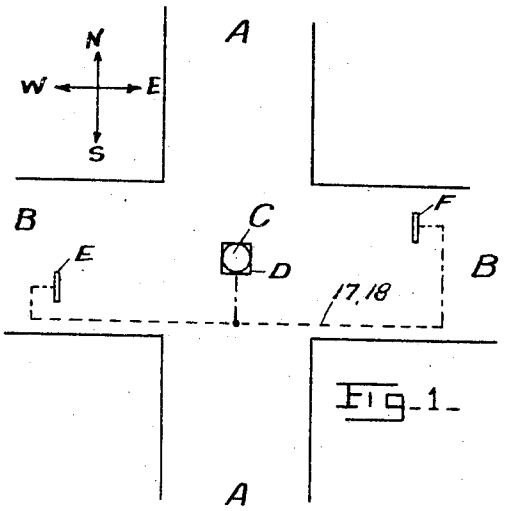


Fig 1.

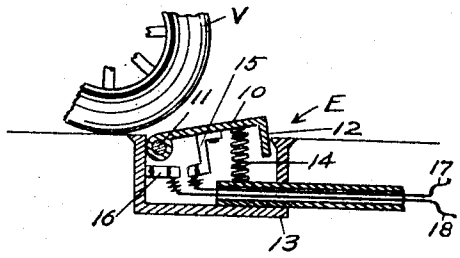


Fig 2.

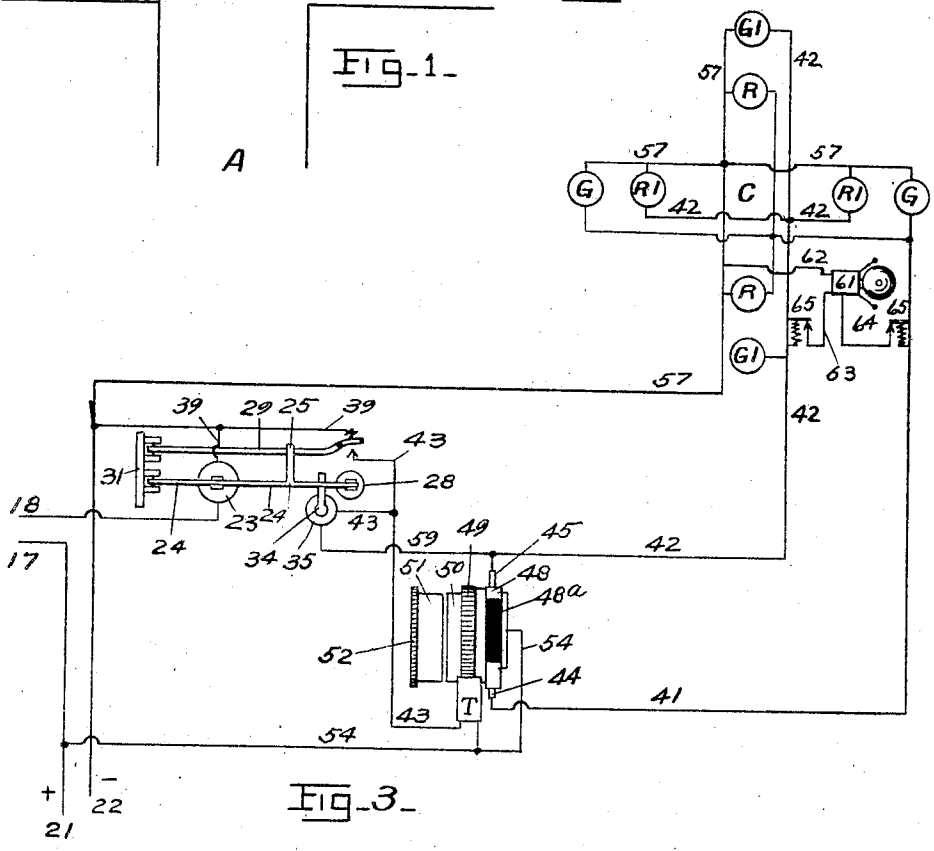


Fig 3.

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2 Sheets-Sheet 2

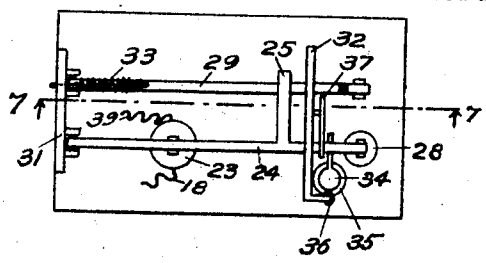


Fig-4-

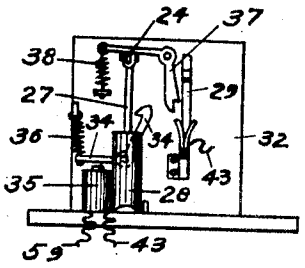


Fig-5-

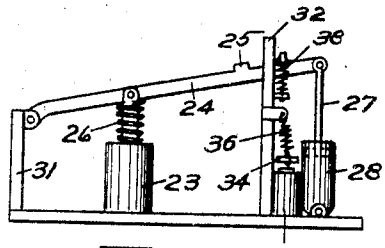


Fig-6-

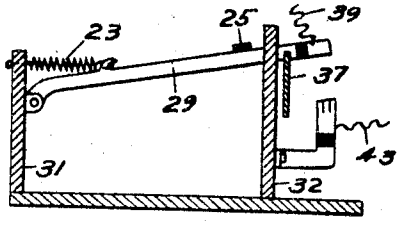


Fig-7-

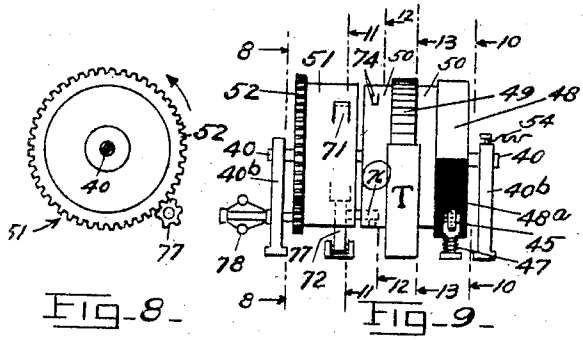


Fig-8-

Fig-9-

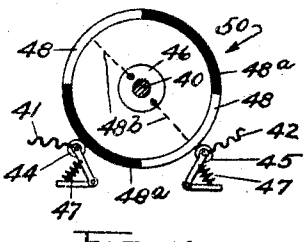


Fig-10-

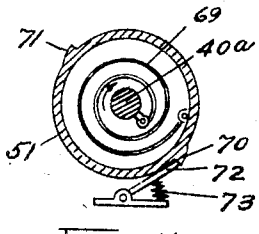


Fig-11-

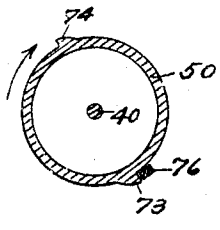


Fig-12-

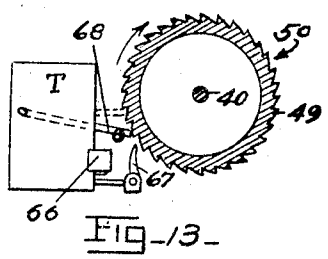


Fig-13-

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Patented Apr. 10, 1928. 1,665,560

UNITED STATES PATENT OFFICE.

ROBERT O. NELSON, OF PORTLAND, OREGON.

VARIABLE TRAFFIC SIGNAL.

Application filed May 16, 1925. Serial No. 30,865.

REISSUED

This invention relates to traffic controlling and regulating devices, and the primary object is to provide an automatic signalling device at the intersection of a main or arterial highway and a cross road which ordinarily accommodates a lesser amount of traffic, whereby the right-of-way will be constantly maintained on the highway until a vehicle on the cross road approaches the intersection, whereupon the signalling system will be reversed, by being actuated by such vehicle, to give it the right-of-way across the highway, after which the right-of-way signals again revert to the highway or main traffic. A further object consists in providing means whereby the right-of-way will be automatically alternated for periods of, for instance, thirty seconds to each road when traffic is constantly approaching the intersection on the cross road. Still further and more specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, wherein:

Figure 1 is a plan view of a street or road intersection, showing the position of the trigger switches in the cross road.

Figure 2 is a sectional elevation through one of the trigger switches.

Figure 3 is a diagrammatic plan view showing the wiring and connections of the electrical control system.

Figure 4 is a plan view of a magnetic switch employed in the circuit system.

Figures 5 and 6 are end and side views, respectively, of the switch shown in Figure 4.

Figure 7 is a sectional elevation on the line 7—7 in Figure 4.

Figure 9 is an elevation of an alternator used in the device.

Figures 8, 10, 11, 12, and 13 are sectional views as seen substantially on the respective lines 8—8, 10—10, 11—11, 12—12, and 13—13, in Figure 9.

Referring to the drawings more particularly and by reference characters A designates a north and south street or road, hereinafter referred to as the highway, which is crossed by an east and west street B, hereinafter designated as the cross road, and at the middle point of the intersection is a conventional signaling standard C, in the base of which may be arranged the control box D. The signals may be of any of the well known types in which the "Stop" and "Go" signs are electrically lighted and alternated so that when the sign reads "Stop" in one direction it will read "Go" in the other or cross direction, and vice versa. Thus in Figure 3 I have indicated signal lamps R, R as the red or stop lamps for the highway, and these lamps are circuitously connected with the lamps G, G, which are the green or "Go" lamps of the cross road; while the R^1, R^1 "Stop" lights for the cross road are connected in circuit with and are simultaneously energized with green "Go" lamps G^1, G^1, which give the right-of-way to the highway traffic, and stop the cross road traffic.

The circuit controlling mechanism (later to be described) which controls the two circuits to the lamps in the signal, is preferably contained within the control box D, and the traffic situation on the cross road is indicated and communicated to this mechanism through auxiliary circuits which are controlled by what I conveniently term trigger switches E and F, which are closed by the passing of vehicles over them. These switches are secured in the street or road B and are arranged in the path of travel of the vehicles about as shown in Figure 1.

The design or construction of these trigger switches may be greatly varied and modified but a preferred form is illustrated in Figure 2 and is substantially the same as the trigger switch shown in Figure 3 of my copending application for patent Ser. No. 695,596, which was filed on February 27, 1924, for automatic variable traffic regulator. It consists, primarily, of a box or casing 13 which is imbedded in the street, and has a plate 10 pivotally secured therein, as at 11. The swinging end of the plate 17 has a flange 12 which tends to keep the box closed when the plate is in its raised position. The plate 17 is normally retained in an inclined or raised position as shown, by a spring 14, but when travelled over by the wheel of a vehicle, is depressed to a flush or horizontal position where it stops. A pair of switch terminals 15 and 16 are respectively secured to the plate 10 and box 13, and close together when the plate is depressed, and thus close a circuit through wires 17 and 18 which lead to the control box through a suitable conduit.

Before tracing the circuits in and to the control box and to the lighting group and

trigger switches, the mechanism or mechanical structure contained within the control box will first be described as follows:

The magnetic switch shown in Figures 3, 4, 5, 6 and 7 consists of a suitable base having an end wall 31 and an intermediate wall 32. A solenoid 23 is mounted on the base and serves, when energized, to pull a lever 24 down against the yielding tension of a spring 26. When the solenoid is de-energized, the spring 26 tends to restore the lever 24 to its upper position, as shown in Figures 5 and 6. This upward movement is retarded, however, by an air check consisting of a pivoted cylinder 28 in which operates a piston 27 which is connected to the outer extremity of the lever 24. A second lever member 29 is arranged parallel with the lever 24, and, like the latter, is pivoted at its rear end to the wall 31, while the forward ends of both levers are guided by being slidable in vertical slots in the wall 32. The lever 29 is yieldingly raised by a spring 33, and is depressed by a laterally projecting finger 25 of the lever 24. When the lever 29 is released by the finger 25 it is retained in its lowered position by a bell crank catch member 37, which is pivoted on 32 and retained by a spring 38. When the lever 24 now returns to its full upward positions, it moves the member 37 to release the lever 29, whereupon the latter may also return to its upward position. The terminal of a wire 39 is mounted at the outer end of the lever 29 so that it will close a switch with a wire 43 the terminal of which is stationary on the wall 32. 39 is also a supply wire to the solenoid 23. The lever 24 is arranged to be retained in its lowered position by a bell-crank hook member 34, which is retained in engagement with the lever 24 by a magnet 35, supplied by wires 43 and 59, but which is released by a spring 36, when the magnet is de-energized.

The alternator indicated in Figure 3 and shown more in detail in Figures 8 to 13, inclusive, will now be described as follows: A shaft 40 is journaled in suitable end brackets 40^b. A drum 50 is rigidly secured on the shaft to rotate with it, and a drum 51 is rotatably mounted on the shaft. The drum 50 has a ratchet wheel 49 adapted to be engaged by a timing unit or mechanism T when a circuit is closed through the wires 43 and 54. The timer T may be of any common and well known construction which is capable of lifting and dropping an arm or dog 68 at regular intervals so as to turn the ratchet wheel 49 the length of one tooth for each elevation of the dog. A pawl 67 is brought to bear against the ratchet wheel 49 by a magnet 66 which is also placed in the circuit 43—54. It will thus be seen that the pawl 67 will prevent the reverse rotation of the ratchet wheel when the latter is being rotated by the dog 68, but will allow the wheel to return to its initial position when the timer is inactive and the circuit 43—54 is broken.

Within the drum 51 the shaft is enlarged as at 40^a (Fig. 11) and to it is fastened one end of a coil spring 69, the other or outer end of which is secured to the inner face of the drum. Now when the shaft is rotated, by the drum 50, the spring 69 winds itself about the shaft. The drum 51 is held stationary, against the rotating tendency of the spring, by a pawl 72, which is held against the periphery of the drum by a spring 73, and releasably engages the stop or lug 70 or 71 on the drum. As the shaft 40 continues to rotate it will be evident that the spring tension would soon become excessive, and to relieve this tension (without reversing the drum) I provide the drum 50 with a pair of diametrically opposed tripping lugs 73 and 74, which at certain intervals in the movement of the drum 50 act against a projection 76 of the pawl 72, and releases the latter from the lugs 70, 71. To prevent the drum 51 from returning too rapidly, when so released, I provide a small governor 78 which is operatively associated with the drum through gears 77 and 52.

When the ratchet wheel 49 is freed from the timer T, the spring 69 will reverse the direction of the shaft and also the drum 50. This reverse movement is checked, however, by the arm 76 of the pawl 72, which engages either of the teeth 74 or 73 to stop the drum 50 in an initial position.

An essential or primary alternator is mounted on the drum 50 and consists of a peripheral path 48—48^a (Figs. 9, 10) having alternating conducting and non-conducting areas which rotate in contact with brushes 44 and 45, which are yieldingly retained in contact with the path by springs 47, and which are terminals for wires 42 and 41, respectively. The conducting areas 48 are supplied by wires 48^b from a member 46 on the shaft 40, which in turn is supplied through its journal in the bracket 40^b by the wire 54. The initial position of the drum is such that the terminal brush 45 will have contact with an intermediate point on one of the areas 48.

The circuit wiring will now be set forth. Wires 21 and 22 represent the power supply, which, for convenience in tracing we can assume to be positive in wire 21, and negative in wire 22. When there is no cross road traffic to actuate the switches E or F there will be a closed circuit through the elements 21, 54, 40^b, 40, 46, 48^b, 48, 45, 52, and 22, thus lighting the lamps R^1, R^1 and G^1 G^1, and giving a constant right-of-way to the traffic on the highway. Now when an east or west bound vehicle approaches the intersection on the cross road, it depresses

the plate 10 of the trigger switches E or F, and in so doing closes a circuit between the wires 17 and 18, and energizes the solenoid 23, via 39 and 18, resulting in the closing of a contact between the terminals 39 and 43 as above described. The wire 43 now gives a negative supply to the magnet 35 and the timer T of the alternator, and the wire 54 carries a positive charge to the timer and to the contact areas 48. Thus the timer is actuated as soon as the contact between 43 and 39 is made. A branch 59 of the wire 42 carries a positive charge, when the terminal 42 has contact with 48 of the alternator, to the retention magnet 35, and consequently the magnet 35 is energized while 43—39 is closed. When a circuit is closed through wires 42, then the signal lamps G^1, G^1, and R^1, R^1, are supplied, signalling the right-of-way to the highway traffic as 57 is the negative wire to all the lamps, and when the wire 41 is charged then the opposite lamps G, G, R, and R are energized, to signal the right-of-way to traffic on the cross road.

In order that a bell signal of short duration may be given, as the right-of-way is changed from one direction to the other, I provide a thermal switch 65 in each of the circuits of 41 and 42. Each of these switches is constructed so that it will break the circuits through wires 63 and 64, to the bell 61, shortly after the current starts flowing in 41 or 42. To avoid "short circuits" separate circuits are provided for the bell by way of a negative wire 62 to the wire 57.

Having now described the construction and action of the device and its various parts, it will be understood, that the right-of-way wall be constantly retained on the highway until approaching cross traffic has depressed one of the trigger switches E or F and for a brief period of time thereafter, such period being about fifteen seconds or half the length of contact area 40 (Fig. 10), thus permitting a steady flow of traffic on the highway as long as possible, and shortly after the circuit 17—18 is closed by a cross road vehicle, the right-of-way will be transferred to the cross road, and the vehicle will be given ample time to cross the highway. This time will of course, be determined by the air check 27—28 which preferably maintains the circuit for eight or ten seconds before releasing the alternator to its initial position. In the event there is a continuous stream of cross traffic then the right-of-way would be alternated for periods of, for instance, thirty seconds in each direction, by virtue of the action of the magnet 35 with respect to the alternator.

It is further understood that various modifications may be made in the general design and structural details of the invention as herein illustrated and described, providing, however, that such modifications come within the spirit and scope of the appended claims.

Having now, therefore, fully shown and described my invention, what I claim to be new and desire to protect by Letters Patent is:—

1. A signalling system arranged at the intersection of a highway and a cross road for regulating traffic, said system including a highway lamp circuit and a cross-road lamp circuit, a time controlled switch associated with said circuits for alternately opening and closing the same, said switch being normally idle in an initial position so as to normally retain the highway circuit closed and permit highway traffic to cross the intersection, means actuated by a vehicle approaching the intersection on the cross road for actuating the switch so as to alternately de-energize the highway circuit and energize the cross road circuit to successively signal the right-of-way to the cross road and highway, said means including the time controlled switch and being operative for automatically restoring the switch and the lamp circuits to their initial conditions.

2. A street crossing 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 for rendering said time controlled means active, and means operated by the switch at the end of its cycle to render the time controlled means again inactive.

3. A street crossing signalling system including a pair of signal circuits, one circuit including a signal to indicate Stop and the other to indicate Go, switching means movable through a cycle for alternately energizing said circuits, normally inactive time controlled means for moving said switching means through its cycle, vehicle actuated means for rendering said time controlled means active, and means including the switch for restoring the time controlled means to its inactive condition.

4. A street crossing signalling system including a pair of signal circuits, one circuit including a signal to indicate Stop and the other to indicate Go, switching means movable through a cycle for alternately energizing said circuits, normally inactive time controlled means for moving said switching means through its cycle, vehicle actuated means for rendering said time controlled means active, and means operated by the switch at the end of its timed cycle, for ren-

dering the time controlled means again inactive.

5. A street crossing signalling system including a pair of signal circuits, one circuit including a signal to indicate Stop and the other to indicate Go, the Go signal circuit of which is normally closed and the Stop signal circuit open, a normally inactive time controlled switching means for successively and alternately reversing the open and closed positions of the circuits for predetermined periods of time, vehicle actuated means for rendering the switching means active, and means including the time controlled switching means for rendering the switching means inactive so as to restore the circuits to their initial conditions.

In testimony whereof I affix my signature.

ROBERT O. NELSON.