Oct. 31, 1933. F. T. FEREDAY 1,933,010

FLASHING TIME RELAY

Filed March 15, 1927 7 Sheets-Sheet 1

Fig. 1.

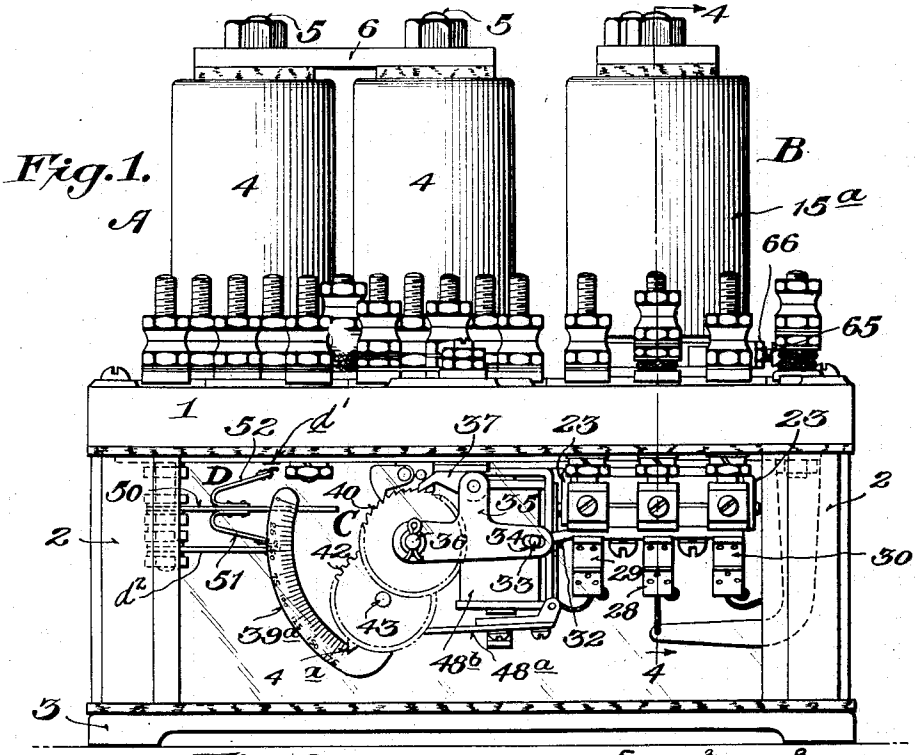
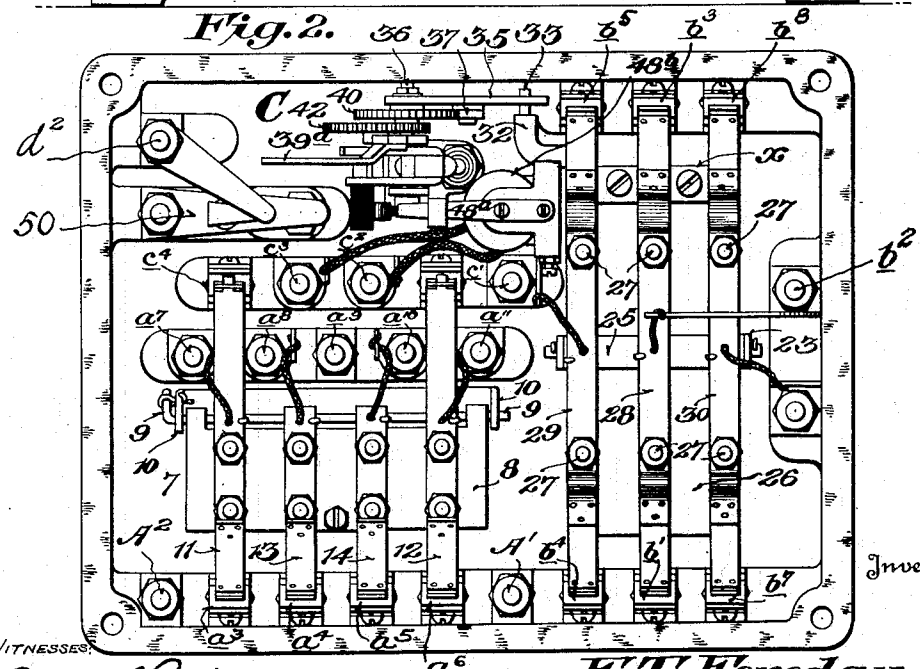


Fig. 2.



Inventor

WITNESSES:

Chas L Greisbauer

Conrad D Groff

By F. T. Fereday,

D. F. Wolcharder

Attorney

Oct. 31, 1933. F. T. FEREDAY 1,933,010

FLASHING TIME RELAY

Filed March 15, 1927 7 Sheets-Sheet 2

Fig. 4.

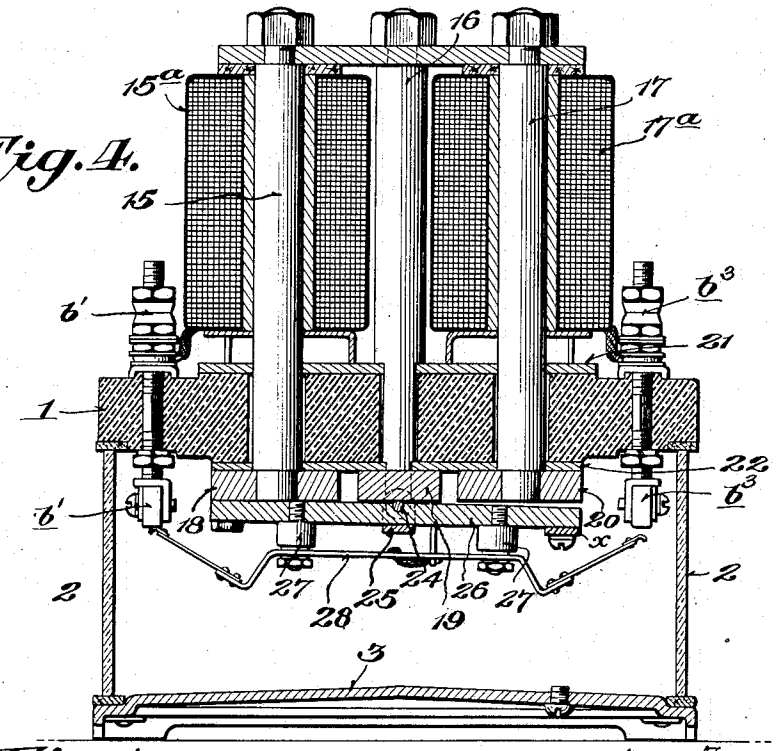
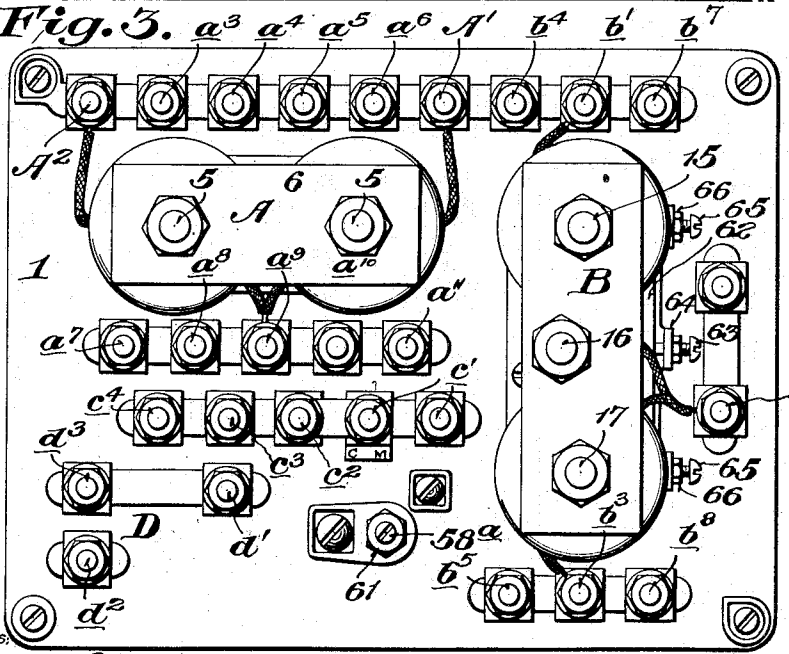


Fig. 3.



Inventor

WITNESSES:

Chas. L. Griesbauer

Emory L. Groff

By F. T. Fereday,

D. F. Wolhaupter

Attorney

Oct. 31, 1933. F. T. FEREDAY 1,933,010

FLASHING TIME RELAY

Filed March 15, 1927 7 Sheets-Sheet 3

Fig. 5.

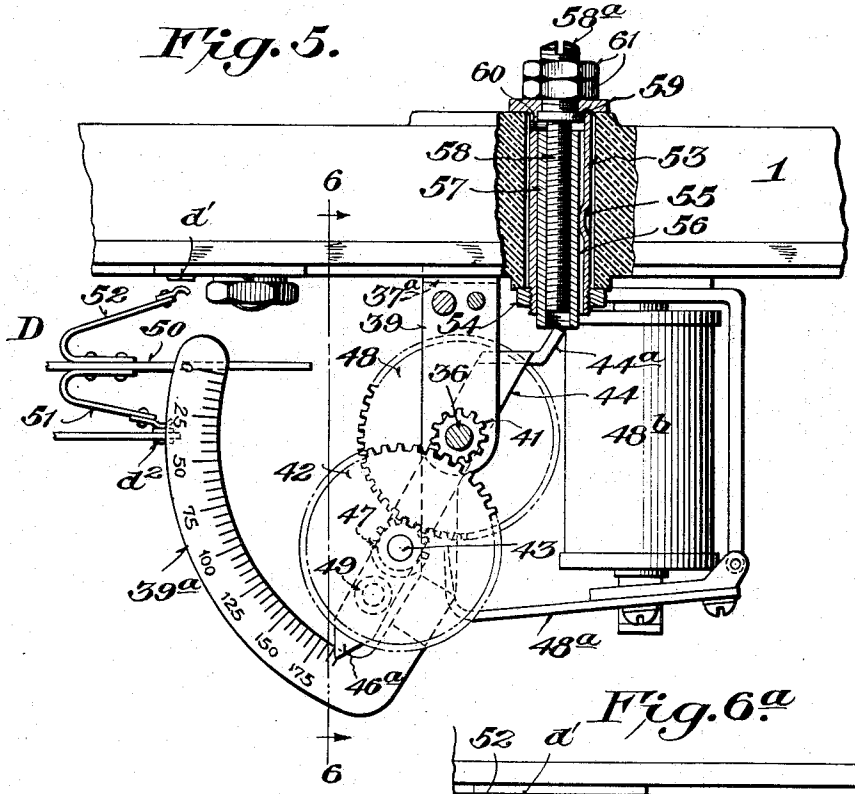


Fig. 6.

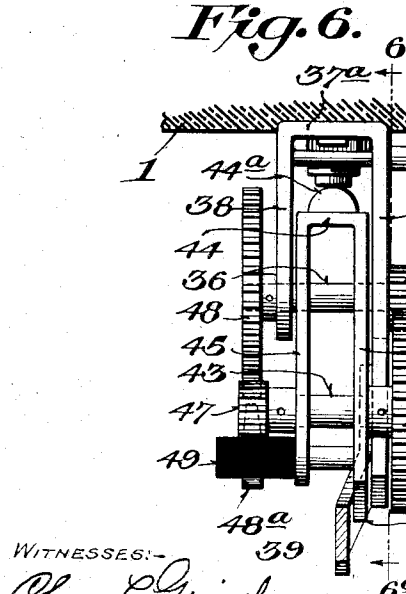
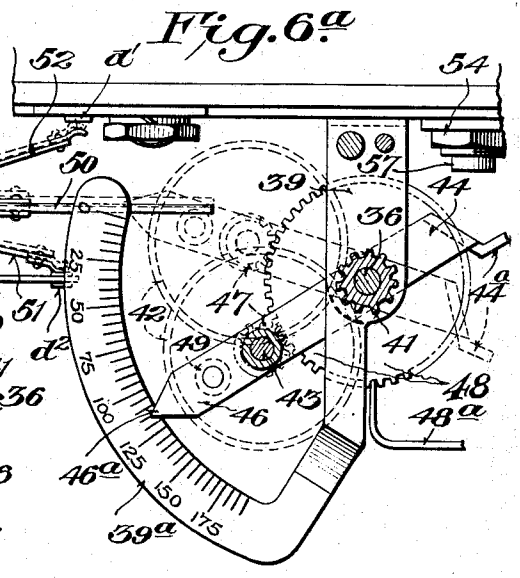


Fig. 6a.



Inventor

F. T. Fereday,

By D. F. Wolhaupter

Attorney

WITNESSES:-

Chas. L. Griesbauer

Edmund R. Graff

Oct. 31, 1933. F. T. FEREDAY 1,933,010

FLASHING TIME RELAY

Filed March 15, 1927 7 Sheets-Sheet 4

Fig. 7.

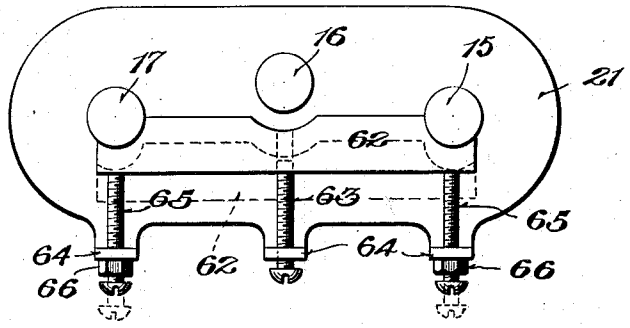
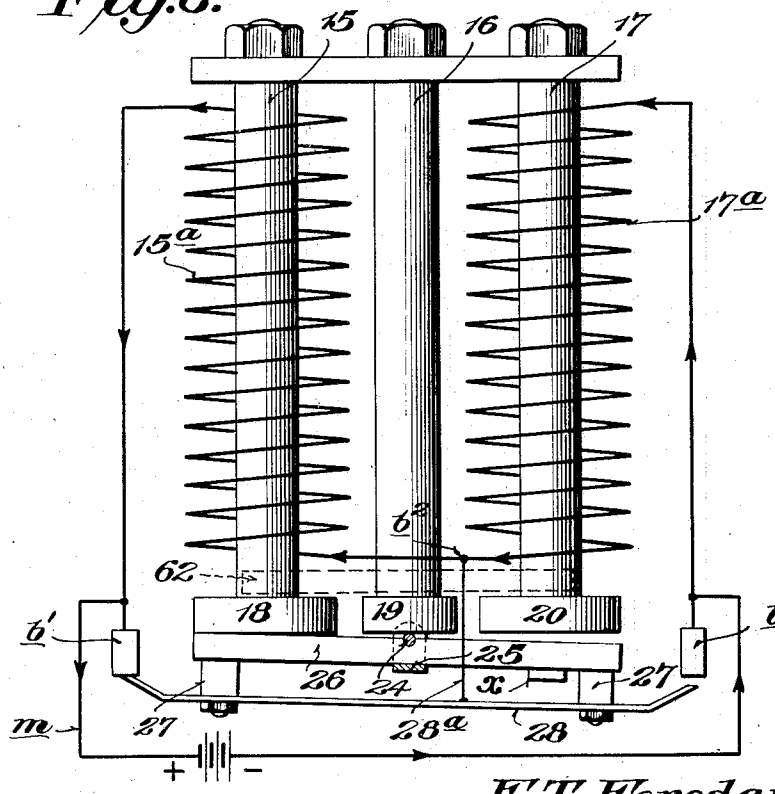


Fig. 8.



Inventor

F. T. Fereday,

By D. F. Wolhaupter

Attorney

WITNESSES:-

Chas. L. Griesbauer

Emory Deroff

Oct. 31, 1933. F. T. FEREDAY 1,933,010

FLASHING TIME RELAY

Filed March 15, 1927 7 Sheets-Sheet 5

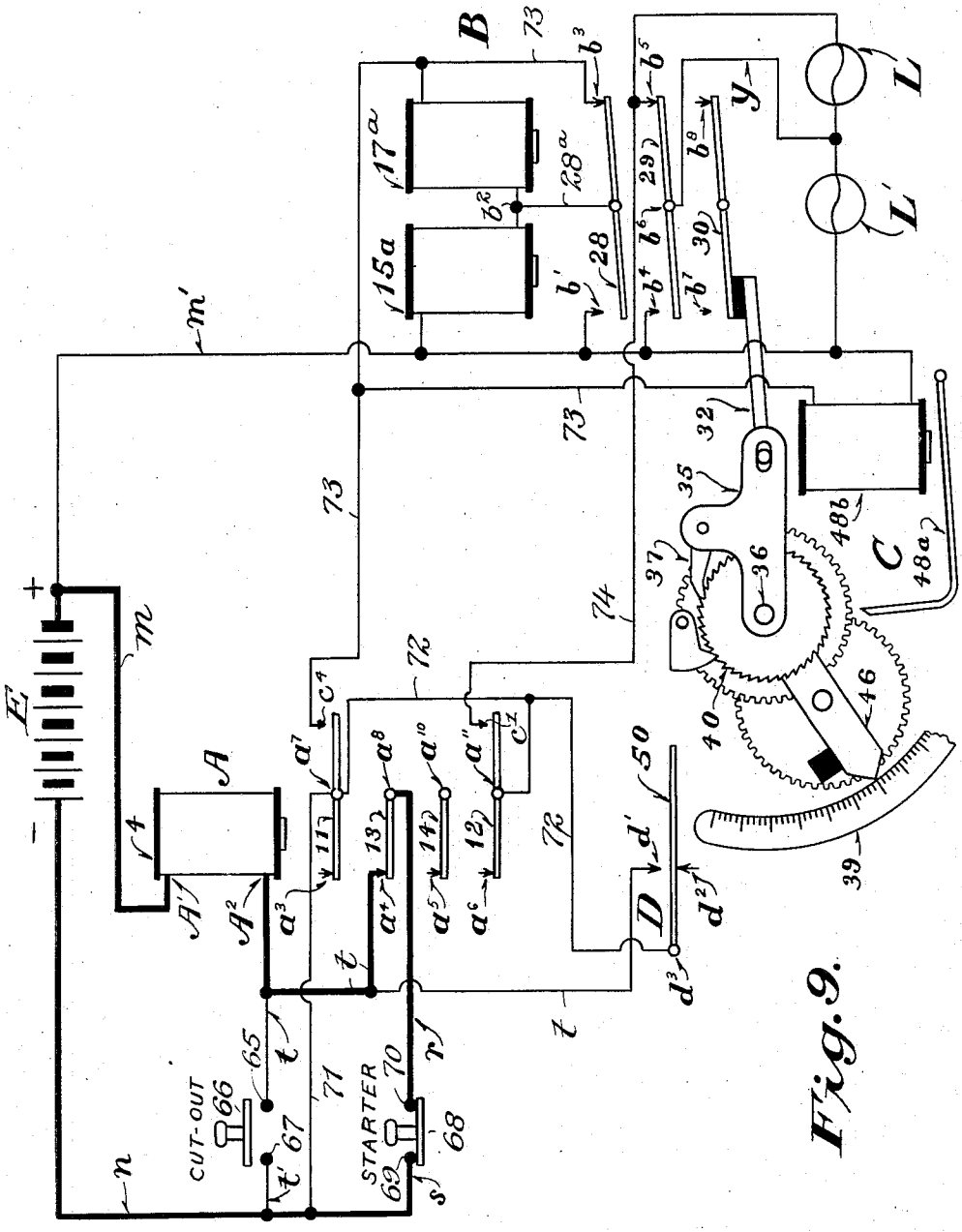


Fig. 9.

INVENTOR.
F. T. Fereday
BY D. P. Wolhaupter
ATTORNEY.

Oct. 31, 1933. F. T. FEREDAY 1,933,010

FLASHING TIME RELAY

Filed March 15, 1927 7 Sheets-Sheet 6

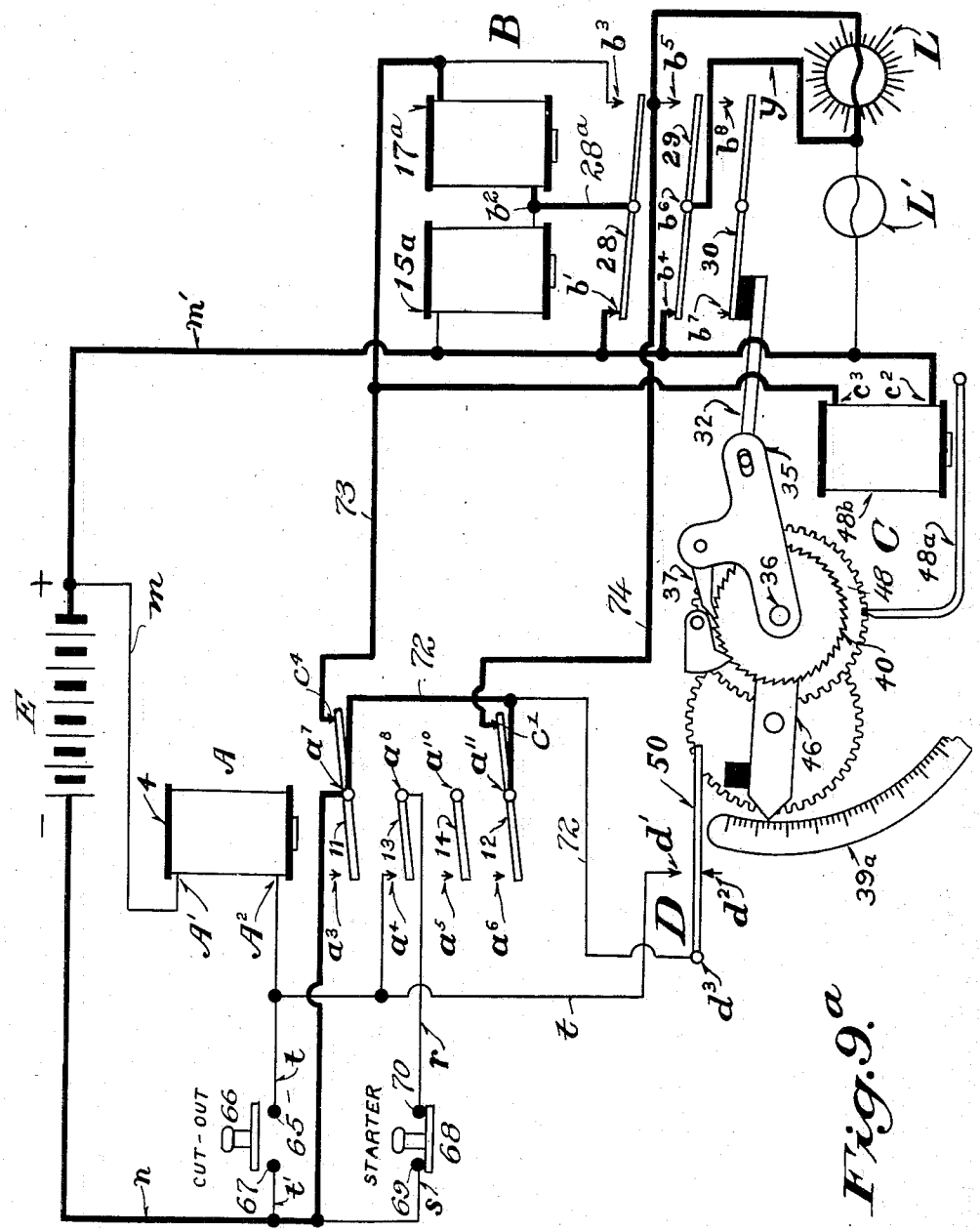


Fig. 9a

INVENTOR.
F. T. Fereday
BY D. P. Wadsworth
ATTORNEY.

Oct. 31, 1933. F. T. FEREDAY 1,933,010

FLASHING TIME RELAY

Filed March 15, 1927 7 Sheets-Sheet 7

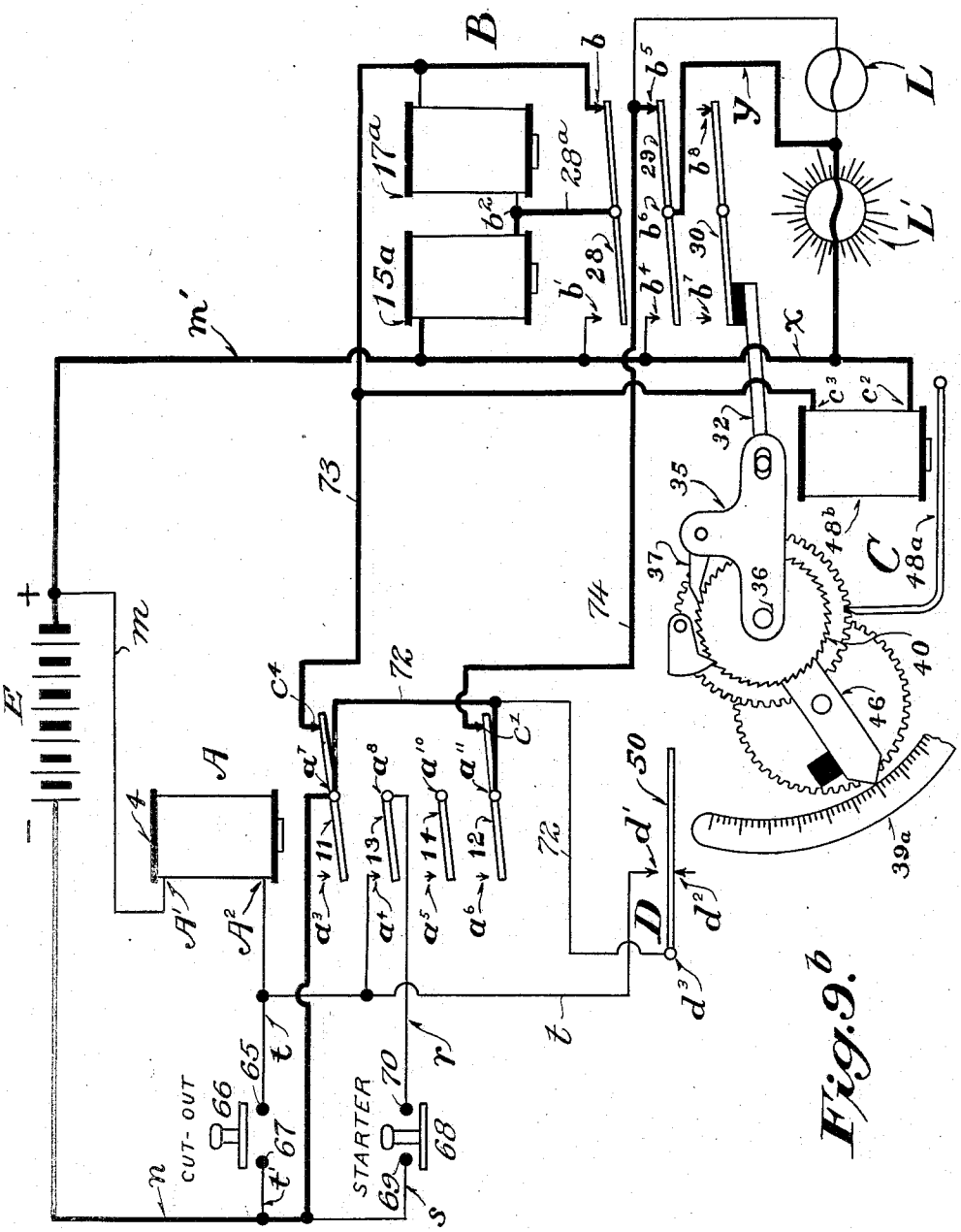


Fig. 9.

INVENTOR.
F. T. Fereday,
BY O. P. Wolhaupter
ATTORNEY.

Patented Oct. 31, 1933

1,933,010

UNITED STATES PATENT OFFICE

1,933,010

FLASHING TIME RELAY

Frederick T. Fereday, Anchorage, Ky., assignor, by mesne assignments, to Peerless Manufacturing Corporation, Louisville, Ky., a corporation of Kentucky

Application March 15, 1927. Serial No. 175,616

5 Claims. (Cl. 177—329)

This invention relates to electrical signaling systems, and has particular reference to an electrical signaling system which is especially adapted for the control of warning signals at highway crossings, i. e., at points where roads, highways or the like cross railroad tracks. However, the system is by no means limited to such use but on the contrary is readily capable of various other analogous uses.

One well known type of highway crossing signal comprises a pair of red lamps mounted in suitable spaced relation on a pole or other support at a suitable location in the vicinity of the crossing and adapted to be flashed alternately when a train is approaching or blocking the crossing. The present system is particularly adapted to include a signal of this type, and in this connection the general object of the invention is to provide novel means whereby the lamps are maintained normally unlighted, but are caused to flash when a train is approaching or blocking the crossing and to again assume their normal unlighted condition when the train has passed the crossing. Also, in this connection it is an object of the invention to provide for flashing of the lamps during only a limited amount of time in any instance where the flashing is initiated by the approach of a train which does not subsequently proceed to the crossing, as, for example, in the case of movement of a switch engine toward and from the crossing at one side thereof.

To the end of providing for control of a signal of the general type mentioned, in the general manner mentioned, the present system is inclusive of a switch device operable to alternately open and close the signal lamp circuits, a neutral relay in control of said switch device and itself under control of train operable switch devices, and a cut-out switch device operable by the first mentioned or lamp flashing switch device to open the circuit thereof after the elapse of a predetermined period of time. In this connection an important object of the invention is to provide a compact, unitary assembly of the neutral relay with the lamp flashing and cut-out switch devices thereby to provide for facility and economy in the production and installation of these parts.

Another object of the invention is to provide means whereby the period of time during which elapses between initiation of operation of the lamp flashing switch device and operation of the cut-out switch to open the circuit of said lamp flashing switch device may readily and easily be varied and predetermined.

With the above and other objects in view which will more readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

A preferred and practical embodiment of the invention is shown in the accompanying drawings in which:—

Fig. 1 is a front elevation of the complete construction ready for installation.

Fig. 2 is a bottom plan view of the insulating mounting base, illustrating the general arrangement and relation of the master switch controlled by the neutral relay, the rocking switch controlled by the flasher relay, and the timing element.

Fig. 3 is a top plan view of the construction shown in Fig. 1.

Fig. 4 is a vertical sectional view taken on the line 4—4 of Fig. 1.

Fig. 5 is an enlarged detail view of the time element.

Fig. 6 is a detail sectional view taken on the line 6—6 of Fig. 5.

Fig. 6^a is a detail sectional view taken on the line 6^a—6^a of Fig. 6.

Fig. 7 is a detail view illustrating the speed regulating means.

Fig. 8 is a diagrammatic view of the circuits involved in the flasher unit.

Figs. 9, 9^a and 9^b are diagrammatic views illustrating the circuits involved, the active circuit in each view being indicated in heavy lines and the inactive circuits being indicated by light lines.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

Referring to the drawings in detail, it will be observed that the present system is primarily inclusive of a neutral relay designated generally as A, a lamp flashing switch device designated generally as B, and an automatic cut-out switch device designated generally as C and D, which

parts or units preferably but not necessarily are mounted on a common insulating base 1 and thus are combined in a unitary assembly as best illustrated in Figs. 1 to 3 of the drawings.

The neutral relay A is inclusive in the present instance of an electro-magnet of the horseshoe type comprising a pair of coils 4—4 and related cores 5—5 connected at their upper ends by a yoke 6, these coils being suitably mounted on top of the base 1 near one side and one end thereof and being in controlling relation to an armature 8 which is pivotally mounted for rocking movement on a pin or trunnion 9 journaled in downwardly directed ears of a bracket 10 carried by the base at the underside thereof.

The armature 8 carries a pair of main switch contact fingers 11 and 12 arranged adjacent to the sides thereof, and a pair of intermediate contact fingers 13 and 14, only one of which, 13, is used in the present instance, the other being available for any use desired. The armature is unbalanced so that when the magnet of the relay is deenergized the armature drops to a position in which the fingers 11, 12 engage contacts C^4, C^1, respectively. On the other hand, when the magnet of the relay is energized, the armature is lifted to a position in which the fingers 11 and 12 are disengaged from the contacts C^4 and C^1 and are engaged with contacts a^3, a^6, respectively, (not used in the present instance) simultaneously with engagement of the finger 13 with a contact a^4 and engagement of the unused finger 14 with its related contact a^5.

The flasher unit B includes a pair of magnets comprising the cores 15, 16 and 17, the cores 15 and 17 being surrounded by the coils 15^a and 17^a respectively, and all three of the cores having pole pieces 18, 19 and 20. The said cores pass through the insulating mounting piece 1 which at the point where the cores pass through the same is fitted with the top and bottom core plates 21 and 22 of nonmagnetic material. The lower core plate 22 is provided at its medial side edges with the downturned ears 23 which receive a pin or trunnion 24 and which latter in turn supports the bracket 25 that carries the rocking armature 26. This armature carries therewith, through the medium of the insulating studs 27, a plurality of contact springs 28, 29 and 30. These contact springs constitute in effect a flasher switch which is automatically controlled by the magnets 15 and 17. The ends of the springs are provided with contact tips, and the opposite ends of all three springs are adapted to alternately contact with the terminals b^1, b^4 and b^7 at one side of the unit, and with the terminals b^3, b^5 and b^8 at the other side of the unit. The armature 26 is preferably slightly overbalanced (as at x) so that when the magnets are deenergized the armature will contact with one of the pole pieces, for example with the pole piece 18 whereby the contact springs 28, 29 and 30 are adapted normally to engage the terminals b', b^4 and b^7, respectively. However, the contact spring 30 and the terminals b^7, b^8, are not used in the present instance and therefore may be ignored in further considering the unit B.

Referring to Figs. 1, 2, 5, 6 and 6^a which show the cut-out switch C in detail, it will be observed that the armature 26 of the unit B carries therewith an arm 32 having a reduced outer end portion 33 adapted to work in a slot 34 in one end of a lever 35 which is pivoted on shaft 36 and carries therewith a pawl 37.

The shaft 36 is mounted in a bracket 37^a carried by the underside of the insulating base 1, the said bracket having downwardly extending arms 38 and 39. Loosely mounted on one end of the shaft 36 is a ratchet wheel 40 which is engaged by the pawl 37 and carries therewith a pinion 41. The said pinion in turn engages with a gear 42 fixed on a shaft 43 which is rotatably mounted in a frame 44 comprising the arms 45 and 46 mounted on the shaft 36 for swinging movement with respect thereto. The rotatable shaft 43 mounted in the swinging frame 44 carries at the end opposite the gear 42 a pinion 47 which engages with the gear 48 on the shaft 36. This gear 48 is adapted to be held stationary by a latch 48^a controlled by a magnet 48^b which is included in circuit with the flasher relay B so that while the flasher relay is in operation the magnet 48^b will continuously hold the latch 48^a in position to engage the gear 48 and hold it stationary. Accordingly, when the pawl 37 actuates the ratchet wheel 40 movement will be imparted to the gear 42 through the pinion 41 whereby the shaft 43 will also rotate and cause the pinion 47 carried thereby to turn and ride on the stationary gear 48. In other words, the relative movement between 47 and 48 will cause the pinion 47 to walk up on the teeth of 48 and thereby carry the swinging frame 44 with it.

The arm 46 of the swinging frame 44 is provided at its lower end with a pointer 46^a which is adapted to move over a scale 39^a carried by the lower arm 39 of the fixed bracket 37^a, and therefore as the swinging frame moves it will pass over the scale 39^a which has calibrations reading from "0" to "175" or any desired limit, such for example as indicated in Figs. 5 and 6^a, to indicate the number of flashes to be given by the lamps L and L'. The other arm 45 of the swinging frame carries therewith an offset insulation abutment 49 for engaging with the arm 50 of a cutout switch D.

The said cutout switch includes in addition to the arm 50 the lower contact finger 51 and the upper contact finger 52. Normally the upper contact finger 52 is disengaged from the terminal d' on the insulating base 1, and is engaged with the terminal d^2 which however is not used in the present instance. However, upon upward swinging movement of the frame 44 the insulating abutment 49 is adapted to engage with the arm 50 and move the contact finger 52 into engagement with the terminal d'.

Any suitable or convenient means for setting the swinging frame 44 to operate through a predetermined arc may be utilized, but a preferred means of accomplishing this purpose is illustrated in detail in Fig. 5. This means includes an adjustable member carried by the insulating base 1 and adapted to engage with an offset arm 44^a in the swinging frame. Referring in detail to the construction shown in Fig. 5 it will be observed that a flanged sleeve 53 is secured in the base 1 by a nut 54 and has a plunger 57 slidably mounted therein, the plunger being longitudinally grooved as at 56 and the sleeve 53 having a projection 55 disposed within said groove so that the plunger is held against rotation. A screw 58 is threaded into the plunger 57 and is provided with a collar 59 which is engaged by a pin 60 carried by the sleeve 53 thereby to provide a swivel connection between the screw and the sleeve so that when the screw is rotated by engaging a suitable tool with the slotted end 58^a thereof the plunger 57 may be fed up or down to effect desired adjustment of the

swinging frame. The head or extension 58^a of the screw may be provided with lock nuts 61 for holding the same in the set or adjusted position.

From the foregoing it will be apparent that the normal lowermost position of the swinging frame on the scale 39^a is controlled by the telescoping screw and plunger construction 57—58. Since the time element is driven by the flasher relay, its time period is dependent upon the flasher speed, but the scale is graduated to indicate the number of flashes, so that when the flasher speed is known, the time may be readily calculated. For example, if the flasher relay is operating at 40 flashes per minute and it is desired to operate the time contact for an interval of two minutes, the indicator 46^a may be set at "80" on the scale, or if the speed is thirty flashes per minute and a three minute period is desired, the pointer 46^a should be set at "90" on the scale 39^a. A feature of the invention resides in the provision of means for regulating the speed of the flasher, and that is accomplished through the medium of the adjustable magnetic-flux shunting armature 62 (see Figs. 3 and 7). This armature is placed under the magnet coils 15^a and 17^a of the magnets 15 and 17 and is movable laterally toward and from the cores 15, 16 and 17 by means of the adjusting screw 63 in threaded engagement with the upstanding ear 64 on the plate 21. Also additional screws 65 are employed at each end of the armature, the same being mounted in the ears 66 of the plate 21 for engagement with the rear edge of the armature to properly hold the ends thereof in properly adjusted position. Thus, the screw 63 is the adjusting means while screws 65 are a part of the holding means. Suitable lock nuts may be provided to keep the screws from becoming loose. The adjustable armature 62 is of magnetic material (iron) and offers a by-path or shunt for the magnetic flux or line of force thus varying the speed of operation of the flasher according to its distance from the poles 15 and 17. By moving the armature 62 toward and against the cores it will slow the operation of the flasher and by moving it back the speed of the flasher will be increased. This is due to the fact that when the said armature 16 is against or very close to the cores 15 and 17 a path is provided through which a part of the magnetic flux or lines of force are shunted from the core 15 to the core 17 or vice versa according to which cores are active or inactive, and by thus dividing the magnetic flux which would course through the poles 15 and 16 when the coil 15^a is fed with current, the power of the magnets 15—15^a—18 is diminished thus slowing up the operation thereof; and the same action occurs with respect to the magnets 17—17^a—20 when the coil 17^a is supplied with current.

Referring now to Figs. 9, 9^a and 9^b of the drawings, it will be observed that one terminal A' of the electromagnet windings of the neutral relay A is connected by a conductor m with the positive side of a battery E and that from the other terminal A^2 of said windings conductors t lead to the contact a^4 of the neutral relay, to the contact d' of the cut-out switch D, and to one terminal 65 of a normally open, train operable cut-out switch 66 the other terminal 67 of which is connected by a conductor t' with a conductor n leading from the negative side of the battery E. It will also be observed that a normally closed train operable starter switch 68 has one terminal 69 thereof connected by a conductor s with the conductor n, and the other terminal 70 thereof connected by a conductor r, through the contact a^8 of the neutral relay, with the contact finger 13 of said relay. Also, it will be noted that the contact finger 11 of the neutral relay is connected through the contact a^7 with the conductor s between the cut-out and starter switches 66, 68 by a conductor 71, and that said contact arm 11 additionally is connected by a conductor 72 with the switch arm 50 of the cut-out switch D, as at d^3, and by said conductor with the contact finger 12 through the contact a^{11}.

By further reference to Figs. 9, 9^a and 9^b of the drawings it will be observed that one terminal of each of the magnet windings 15^a, 17^a of the flasher switch B is connected with a contact b^2, whereby the said windings are connected in series, and that from said contact b^2 a shunt conductor 28^a leads to and is connected with the contact spring 28 of said switch; that from the positive side of the battery E a conductor m' leads to and is connected with the other terminal of the winding 15^a and also with the contacts b' and b^4, one terminal of the lamp L'. and one terminal of the winding of the magnet 48^b; that from the contact C^4 of the neutral relay a conductor 73 leads to and is connected with the other terminal of the magnet winding 17^a of the flasher switch, and also with the contact b^3 of said switch, as well as with the other terminal of the winding of the magnet 48^b of the cut-out switch D; that from the contact c' of the neutral relay a conductor 74 leads to and is connected with the contact b^5 of the flasher switch B and alsc with one terminal of the other lamp L, and that the other terminals of the respective lamps are connected by a conductor y through the contact b^6 with the contact spring 29 of the switch B.

The starter switch 68 is placed at a point along the railroad tracks located a suitable distance from the crossing and is of suitable construction to be actuated from its normal circuit closing condition to a circuit opening condition by the passage of a train thereover, and to return to its normal circuit closing condition after the train has passed thereover. On the other hand, the normally open cut-out switch 66 is located either at the crossing or a relatively short distance therefrom at the far side thereof as regards the direction of travel of the train, and is adapted to be train actuated to a closed condition and to return to its normal open condition after the train has passed thereover.

Figure 9 of the drawings shows the normal condition of the circuit; i. e., when no train is approaching. The switches 66, 68 being in their normal open and closed positions, respectively, current can flow from the battery E only through the circuit illustrated in heavy lines, because all the other circuits have one or more open contacts. Beginning at the positive side of the battery the closed circuit shown by the heavy lines is through the conductor m to the windings of the electromagnets of the neutral relay A, from said windings through the conductor t to the contact a^4, through the contact finger 13 to the contact a^8 and the conductor r, and from said conductor r through the normally closed switch 68 to the conductors s and n back to the negative side of the battery. Thus, the normally energized electromagnet of the neutral relay holds the armature 8 of said relay in a lifted or elevated position to maintain the normal neutral relay circuit and

to maintain the circuits of the flasher switch B and the cut-out switch D normally open, since closing of these latter circuits is dependent upon dropping of the neutral relay armature upon deenergization of the neutral relay magnets.

Assuming now that an approaching train passes over the starter switch 68 and opens the same, it is apparent that the circuit shown by heavy lines in Fig. 9 is broken with consequent deenergization of the magnets of the neutral relay and dropping of the armature 8 thereof to the position shown in Fig. 9^a, in which position of said armature the contact finger 13 is disengaged from the contact a^4. Therefore, even though the starter switch 68 immediately closes following opening thereof, the armature remains in its lower position as shown in Fig. 9^a because of the open condition of the neutral relay circuit at a^4, 13. As heretofore stated and as is apparent from Figs. 9, 9^a and 9^b of the drawings, dropping of the armature 8 of the neutral relay results in engagement of the contact fingers 11 and 12 with the contacts c^4 and c', respectively. Therefore, immediately following opening of the starter switch 68, the circuits of the flasher switch B, the lamps L, L', and the cut-out switch D are closed through the contact fingers 11 and 12 of the neutral relay as shown by the heavy lines in Figs. 9^a and 9^b. That is to say, with the armature 26 of the flasher switch B in its normal position and the contact springs 28 and 29 of said switch engaged with the contacts b' and b^4 and disengaged from the contacts b^3, b^5, respectively, deenergization of the neutral relay results in circuits first being established as shown by heavy lines in Fig. 9^a. From the positive side of the battery current flows through the conductor m' to the contact b', through the contact spring 28 and shunt 28^a to the contact b^2, through the winding of magnet 17^a to the conductor 73 and contact c^4, through the contact finger 11 of the neutral relay to the contact a^7, and from said contact a^7 through the conductors 71, s and n back to the negative side of the battery. Some small amount of current may flow through the winding of the magnet 15^a, but as the path of least resistance is through the winding of the magnet 17^b, the relatively small amount of current that may flow through the winding of the magnet 15 is of no consequence.

At the same time the circuit through the winding of the magnet 17^a is established, circuits through the lamp L and the winding of the magnet 48^b of the cut-out switch D also are established. The first of these circuits is from the positive side of the battery through conductor m' to contact b^4, through contact spring 29 to contact b^6, from said contact through conductor y, thence through lamp L which is the path of least resistance for the current, through conductor 74 to the contact c' of the neutral relay, through the contact finger 12, to contact a^{11}, through conductor 72 to contact a^7, and finally back to the negative side of the battery through the conductors 71, s and n. The second mentioned circuit is from the positive side of the battery through the conductor m' to the winding of the magnet 48^b, through said winding to the conductor 73 and the contact c^4 to the neutral relay, through the contact finger 11 and then to the negative side of the battery through the conductors 71, s and n. Thus, simultaneously with energization of the magnet 17^a of the flasher switch B, the lamp L is lighted and the magnet 48^b of the cut-out switch D is energized with consequent lifting of the latch 48^a into holding engagement with the gear wheel 48.

Upon energization of the magnet 17^a of the flasher switch B the armature 26 of said switch obviously is rocked by said magnet to the position shown in Fig. 9^b, with consequent disengagement of the contact springs 28, 29 from the contacts b', b^4, respectively, and engagement of said contact springs with the contacts b, b^5, respectively. When this occurs a circuit is established from the positive side of the battery through conductor m to and through the winding of the magnet 15^a which is now the path of least resistance for the current, through the shunt 28^a to the contact spring 28 and the contact b, from said contact through the conductor 73 to the contact c^4 of the neutral relay and thence through the contact finger 11, contact a^7 and the conductors 71, s and n to the negative side of the battery. At the same time current flows from the positive side of the battery through the conductor m to the lamp L', through said lamp to the conductor y and the contact b^6, thence through the contact spring 29 to the contact b^5, thence through the conductor 74 to the contact c' of the neutral relay, through the contact finger 12 to contact a^{11}, to conductor 72, to contact a^7 and through the conductors 71 s and n to the negative side of the battery, the lamp L being shunted due to the path of least resistance being through the lamp L'. Thus, simultaneously with rocking of the armature 26 of the flasher switch from its normal position to its position illustrated in Fig. 9^b, the lamp L is extinguished and the lamp L' is lighted, and since rocking of said armature to its position illustrated in Fig. 9^b results in energization of the magnet 15^a and deenergization of the magnet 17^a the armature immediately is rocked back to its initial position reestablishing the lamp circuit illustrated in Fig. 9^a. Accordingly, upon opening of the starter switch 68 rocking of the armature of the flasher switch B is initiated and the lamps L and L' are alternately flashed until the neutral relay magnets are energized to lift the armature 8 and interrupt the circuits to the flasher switch and the lamps. Ordinarily this is effected by movement of the train over the cut-out switch 66 with consequent temporary closing of said switch, whereupon the circuit through the neutral relay magnets is completed through said switch and the conductors t, t' and n, the armature 8 thereby being lifted and being held lifted after opening of the switch 66 by reason of the holding circuit as illustrated in Fig. 9 being reestablished. However, under some conditions the cut-out switch 66 may not be actuated following actuation of the starter switch 68, as, for example, in the case of a switch engine operating at one side only of the crossing. Accordingly, the cut-out switch D affords means to stop the operation of the flasher switch and flashing of the lamps L, L' under such conditions and after the elapse of a suitable time interval. In this connection, since the circuit of the magnet 48^a is not affected by operation of the flasher switch, but remains closed as long as the armature of the neutral relay remains in its lower position as illustrated in Figs. 9^a and 9^b, it follows that the gear 48 of the switch D is held by the latch 48^a against rotation as long as the flasher switch continues to operate. As aforesaid, there is a connection between the armature 26 of the flasher switch and the lever 35 of the cut-out switch D whereby rocking of the armature of

the flasher switch operates the pawl 37 to produce a step-by-step elevation of the frame 44 of the switch D as long as the gear wheel 48 is held against rotation. Thus, as the flasher switch operates, the frame 44 is lifted until the abutment 49 engages the switch arm 50 and lifts the same to engage the contact 52 thereof with the contact d'. When this occurs the effect obviously is the same as closing of the train operable cut-out switch 66. Therefore, even if the cut-out switch 66 is not actuated following actuation of the starter switch 68, the lamps will flash only for a limited period of time as determined by the initial adjustment or lower position of the frame 44 of the cut-out switch D, and the system thereafter will be restored to its normal condition, as obviously, upon closing of the neutral relay circuit by engagement of the contact 52 with the contact d' the circuit through the magnet 48^b of the switch D is interrupted at c^4 with consequent deenergization of said magnet and dropping of the latch 48^a from holding relation to the gear 48, which permits the frame 44 to drop to its normal position.

I claim:—

1. In an electric signaling system, a normally closed neutral circuit, a signal circuit, a signal operating device in said signal circuit inclusive of an element which is movable when the circuit is closed, a relay in said neutral circuit maintaining said signal circuit open when said neutral circuit is closed and operable to close said signal circuit when said neutral circuit is opened, a timing mechanism inclusive of electro-magnetic control means which must be energized to render the timing device operable, a connection between the movable element of said signal operating device and said timing mechanism whereby said movable element actuates said timing mechanism when the signal circuit is closed and said electro-magnetic control means is energized, means whereby said electro-magnetic control means is energized by opening of said neutral circuit and is deenergized by closing of said neutral circuit, and means whereby a predetermined amount of operation of said timing mechanism effects closing of said neutral circuit following opening thereof.

2. In an electric signaling system, a normally closed neutral circuit, a signal circuit, a signal operating device in said signal circuit inclusive of an element which is movable when the circuit is closed, a relay in said neutral circuit maintaining said signal circuit open when said neutral circuit is closed and operable to close said signal circuit when said neutral circuit is opened, a normally open switch operable when closed to close the neutral circuit following opening of the latter, a timing mechanism for closing said switch, said timing mechanism being inclusive of a normally deenergized electro-magnet which must be energized to permit operation of said mechanism to close said switch, a connection between said timing mechanism and the movable element of said signal operating device whereby said movable element actuates said timing mechanism to effect closing of said switch when said electro-magnet is energized, and means whereby said electro-magnet is energized by opening of said neutral circuit and is deenergized by closing of said neutral circuit.

3. In an electrical signalling system, a normally closed neutral circuit, switch means for opening said circuit and thereafter maintaining said circuit open, switch means for closing said circuit following opening thereof by the first named means and cooperating with the first named means for maintaining said circuit closed until again opened by the first named means, a signal circuit including two signals, a signal device in said signal circuit including an element operable in timed sequence between two positions for alternately operating said signals, a relay having its operating coil in said neutral circuit and its contacts in said signal circuit whereby to maintain the signal circuit open when the neutral circuit is closed and to close the signal circuit when the neutral circuit is opened, a mechanism normally stationary, but capable of movement, switch means connected electrically in parallel with the second named switch means and operable by said mechanism and upon a predetermined movement thereof for closing said neutral circuit following opening thereof, electromagnetic control means, means to energize said control means while the neutral circuit is open, and means effective upon energization of said control means and including a connection to said element and to said mechanism for moving said mechanism upon the said movement of said element.

4. In an electrical signalling system, a neutral circuit having a relay through which the circuit is maintained normally closed and which constantly tends to open said circuit whereby upon opening of the circuit the same remains open until the relay is energized, a normally closed starter switch in said circuit for opening the same, a normally open cut-out switch for closing said circuit after the same has been opened to energize said relay thus to restore the normally closed status of said circuit, a signal circuit including two signals and an element rockable when the circuit is closed to alternately operate said signals, said relay having contacts in said signal circuit arranged to maintain said signal circuit open when the neutral circuit is closed and to maintain the signal circuit closed when the neutral circuit is open, normally open switch means connected electrically in parallel with said cut-out switch and operable when closed to close said neutral circuit, an element normally stationary and normally spaced from said normally open switch means, means whereby operation of said rockable element moves said normally stationary element to close said normally open switch means thus to restore the normal status of the neutral and the signal circuits, and means whereby said element is restored to its normal position upon restoration of the signal circuit to its normal position.

5. In an electrical signalling system, a neutral circuit having a relay through which the circuit is maintained normally closed and which constantly tends to open said circuit whereby upon opening of the circuit the same remains open until the relay is energized, a normally closed starter switch in said circuit for opening the same, a normally open cut-out switch for closing said circuit after the same has been opened to energize said relay thus to restore the normally closed status of said circuit, a signal circuit including two signals and an element rockable when the circuit is closed to alternately operate said signals, said relay having contacts in said signal circuit arranged to maintain said signal circuit open when the neutral circuit is closed and to maintain the signal circuit closed when the neutral circuit is open, normally open switch means connected electrically in parallel with said cut-out switch and operable when closed to close said neutral circuit, an element normally stationary and nor-

mally spaced from said normally open switch means, a connection between said rockable element and said normally stationary element inclusive of electro-magnetic control means in the signal circuit whereby, when the signal circuit is closed, operation of said rockable element moves said normally stationary element to close said normally open switch and whereby, when the signal circuit is open, said normally stationary member is permitted to assume its normal position simultaneously with restoration of the neutral and the signal circuits to their normally closed and opened conditions, respectively, by closing of said normally open switch.

FREDERICK T. FEREDAY.