(No Model.)

5 Sheets—Sheet 1.

W. D. SHELDON.

TRAIN SIGNAL.

No. 441,031. Patented Nov. 18, 1890.

Fig. 2.

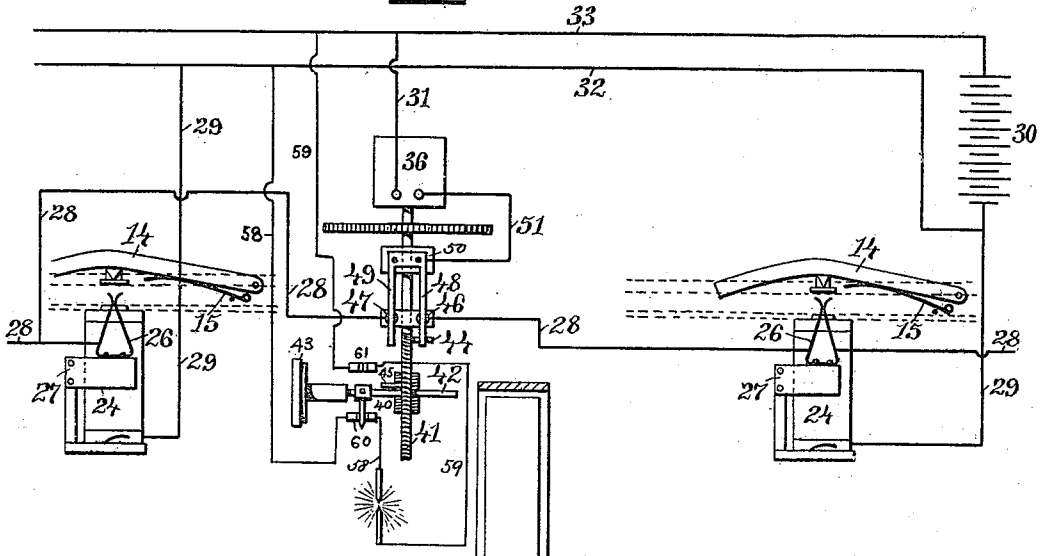
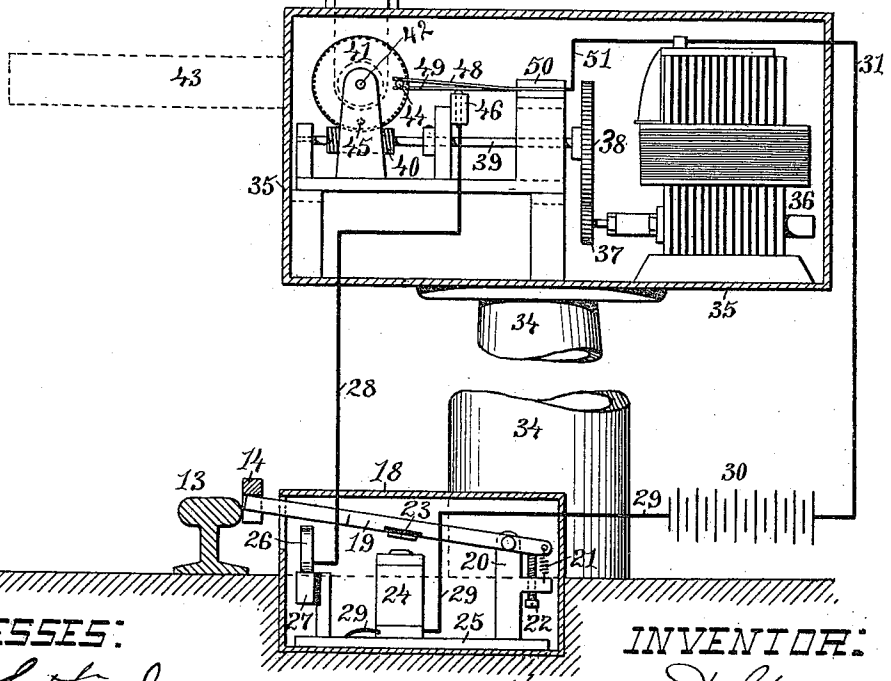


Fig. 1.



WITNESSES:

Chas. H. Luther Jr

M. F. Bligh

INVENTOR:

William D. Sheldon

by Joseph H. Miller & Co.

Attys

(No Model.) 5 Sheets—Sheet 2.

W. D. SHELDON.

TRAIN SIGNAL.

No. 441,031. Patented Nov. 18, 1890.

Fig. 3.

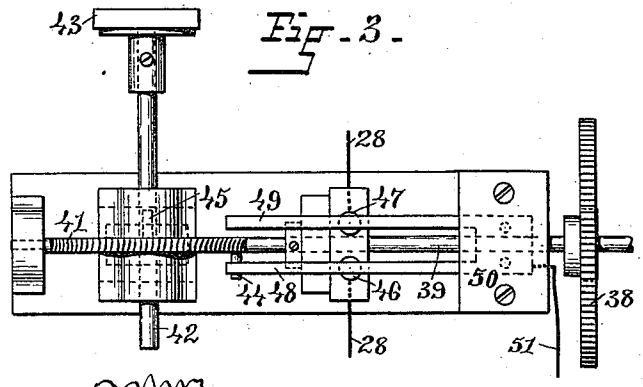


Fig. 4.

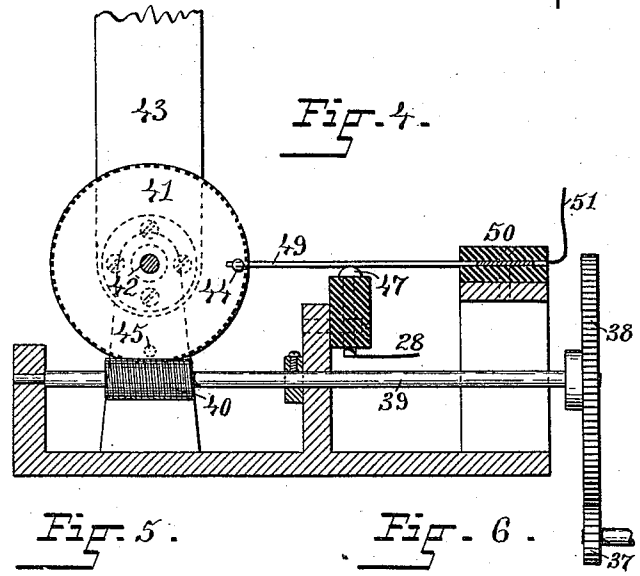


Fig. 5.

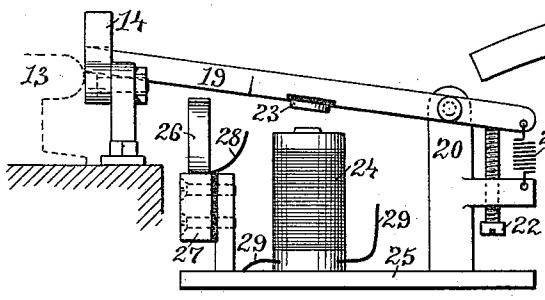
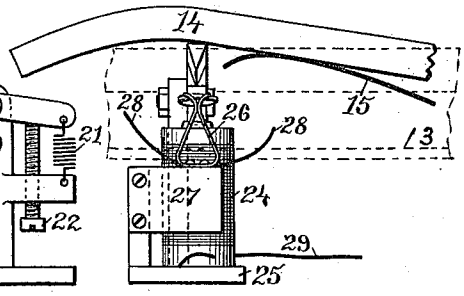


Fig. 6.



WITNESSES:

Chas. H. Luther Jr.

M. F. Bligh.

INVENTOR:

William D. Sheldon

by Joseph N. Miller & Co.

Attys

(No Model.) 5 Sheets—Sheet 3.

W. D. SHELDON.

TRAIN SIGNAL.

No. 441,031. Patented Nov. 18, 1890.

Fig. 8.

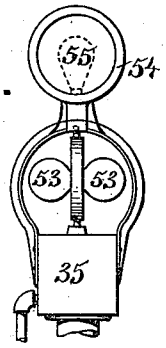


Fig. 7.

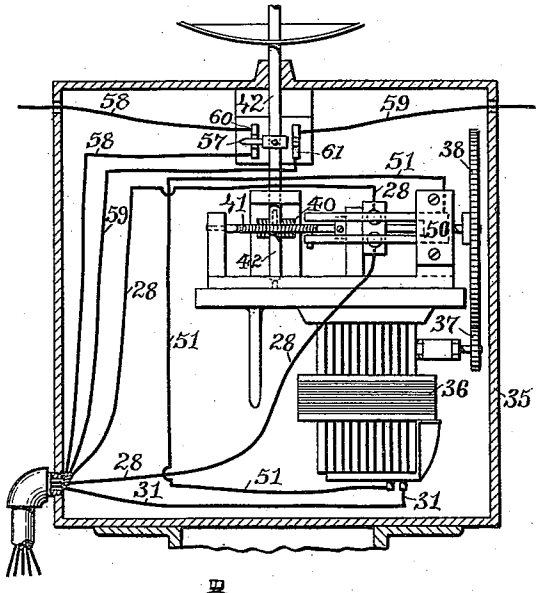


Fig. 10.

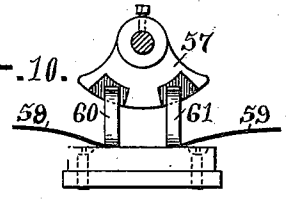
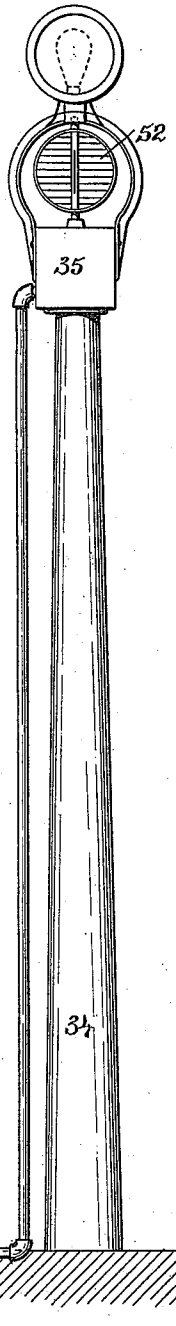
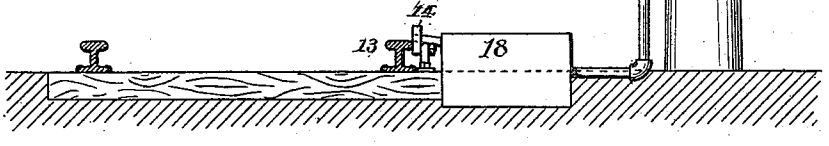


Fig. 9.





WITNESSES:

Chas. H. Luther Jr.

M. F. Bligh

INVENTOR:

William D. Sheldon

by Joseph H. Miller & Co.

Attys

(No Model.) 5 Sheets—Sheet 4.

W. D. SHELDON.

TRAIN SIGNAL.

No. 441,031 Patented Nov. 18, 1890.

Fig. 11.

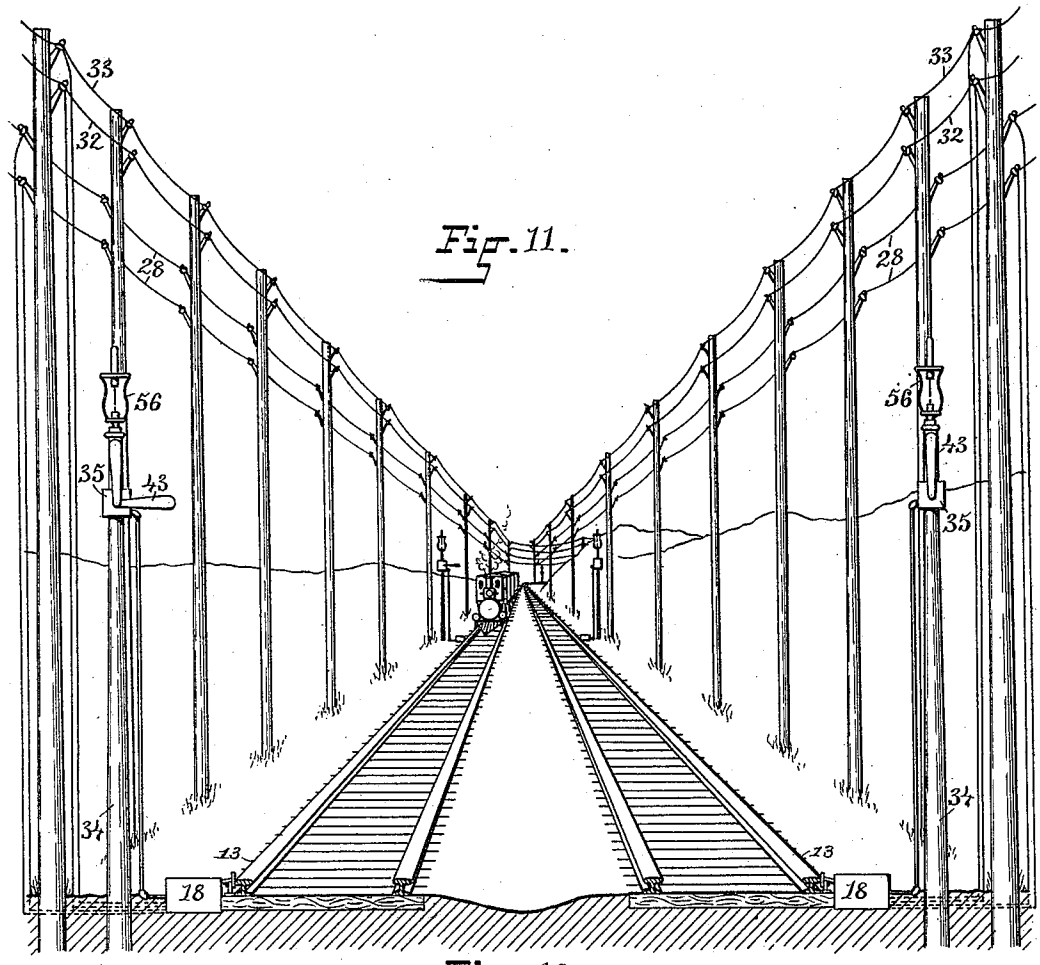
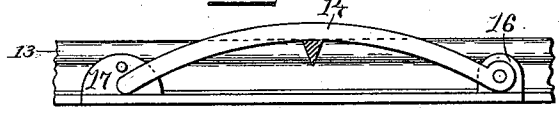


Fig. 12.



WITNESSES:

Chas. H. Luther Jr.

M. F. Bligh

INVENTOR:

William D. Sheldon

by Joseph A. Miller & Co.

Attys.

(No Model.)

5 Sheets—Sheet 5.

W. D. SHELDON.

TRAIN SIGNAL.

No. 441,031. Patented Nov. 18, 1890.

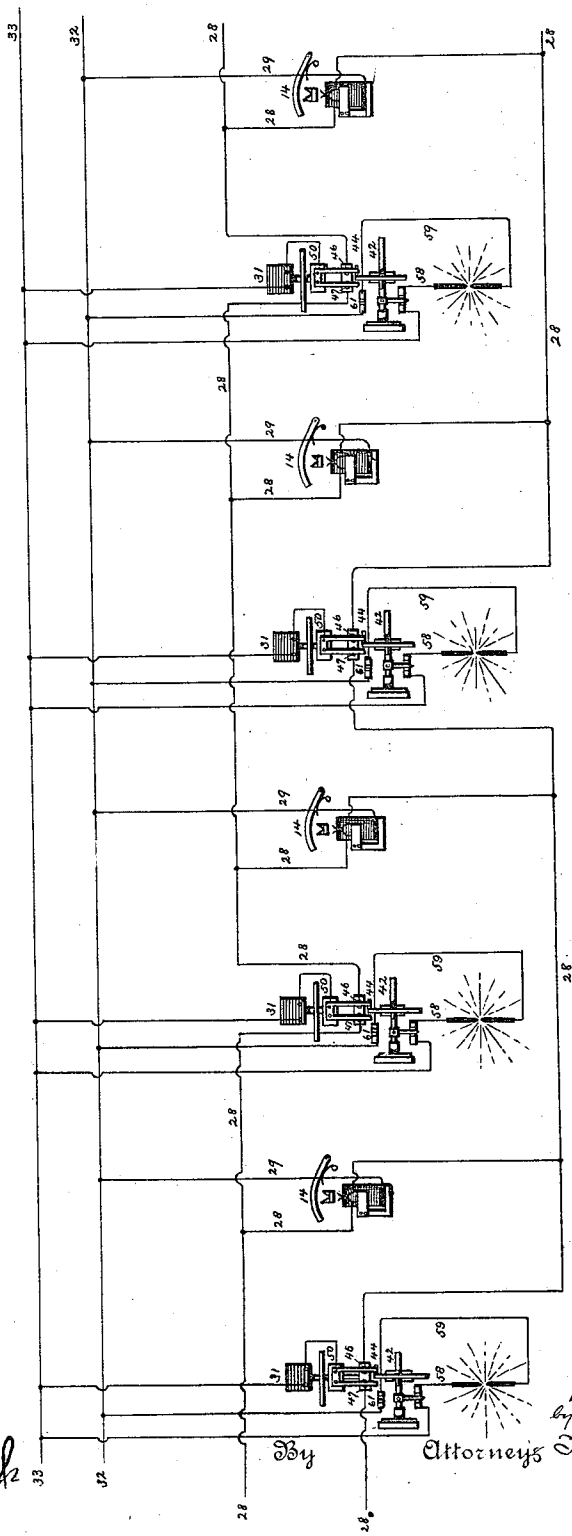


Fig. 13.

Witnesses
Wm. H. Lueders
Chas. H. Luther Jr

Inventor
Wm D. Sheldon
by Joseph A. Miller & Co
Attorneys

By

UNITED STATES PATENT OFFICE.

WILLIAM D. SHELDON, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO NICHOLAS SHELDON, OF SAME PLACE.

TRAIN-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 441,031, dated November 18, 1890.

Application filed September 20, 1889. Serial No. 324,536. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM D. SHELDON, of the city of Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Train-Signals for Railroads; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

This invention has reference to certain new and useful improvements in the construction, arrangement, and operation of signals operated by electromotors connected with and disconnected from an electric circuit through switches operated by the trains, and also refers to the peculiar and novel devices for operating the signals.

The invention consists in providing a switch-operating mechanism operated by the passing train by which the electric current is turned on to an electric motor connected by mechanism with a day-signal at some distance in advance of the train, so as to automatically set the signal to "danger" or "block" in advance of the train.

The invention further consists in providing the switch connecting the electric current with the electric motor in advance of the train with another switch, or with connections with the same switch operating the signal which the train has passed, by which the electric current is connected with an electric motor in the rear of the train passing the switch to operate the day-signal in the rear of the passing train from the "danger" or "blocked" to the "safe" or "open" signal.

The invention further consists in providing the signal-operating mechanism driven by the electric motor with a switch by which an electric light is brought into the circuit or cut out from the circuit when the signal is at "danger," "blocked," "safe" or "open"; and the invention further consists in the peculiar and novel construction of the switch connecting the electric motor with the electric circuit and source of electric energy operated by the passing train, the mechanism for operating the signal through the electric motor, the device for automatically breaking the circuit and stopping the motor, the device for automatically connecting and disconnecting the electric light, and the combination of the various co-operating elements, as will be more fully set forth hereinafter.

Figure 1 is a sectional view showing the switch operated by the passing train, the electric motor, the semaphore or signal-arms, the mechanism for operating the same, the connecting-conductors, and the post, shown partly broken away. Fig. 2 is a skeleton view showing the connections with the main circuit-wires of the switches at opposite ends and the signal mechanism. Fig. 3 is a plan view of the signal-operating mechanism, showing the automatic cut-outs. Fig. 4 is a vertical sectional view of Fig. 3. Fig. 5 is a side view of the switch operated by the train, and Fig. 6 is an end view of the same. Fig. 7 is a view of a modified form of a signal-operating mechanism, showing also the automatic switch for connecting and disconnecting the electric lamp. Fig. 8 is a view of the modified form of day-signal, showing the electric lamp. Fig. 9 is a view of the modified form of signal, showing the connection between the rails, the switch-box, and the motor-box. Fig. 10 is an enlarged view of the automatic switch by which the electric lamp is connected and disconnected. Fig. 11 is a perspective view showing the application of the system to a double-track railroad. Fig. 12 is a view of a switch-operating arm, consisting of a spring-arm hinged at one end and bearing on a plate on the other end for operating the switch when a heavy weight rolls over the curved portion of the arm, and Fig. 13 is a diagrammatic view of the perspective shown in Fig. 11.

Similar letters of reference indicate corresponding parts.

The object of this invention is to provide a system of signals, readily distinguishable both day and night, which will be automatically set by the train.

Another object of the invention is to divide a railroad into sections governed in their length by the conditions of the traffic and nature of the road and provide at each end of each section or block day and night signals automatically operated by the passing train,

so that at all times a signal ahead of the train and a signal in its rear will be displayed by which the engineers of approaching trains will be notified that the section or block is occupied by a train, collisions avoided, and safety of travel materially increased.

I am aware that various attempts have been made to operate signals through mechanical means by the passing train. I am also aware that block-signals have been operated by mechanical means. My invention differs from all these signal-operating devices, as all the operations are performed by electric energy.

In the drawings, the number 13 indicates one of the rails of a railroad. On one side of the rail 13 the arm 14, curved so as to present a central raised portion, is shown hinged at one end and upheld by the spring 15 in Figs. 2 and 6. The arm 14 may, however, be constructed as is shown in Fig. 12, in which the arm forms a curved stiff spring hinged at one end and bearing against the abutment 16, the other end resting on the plate 17, so that on the passing of a train the wheels will depress the upper curved portion of the arm, and the free end will slide on the plate 17. The curved arm 14 is shown as placed on the outside of the track for the sole reason that the connections can be more clearly shown with the operating-switch. In practice the arm 14 may be placed on either side of the track or between the rails. The switch is placed in the case 18, so as to be protected against injury. The switch consists of the lever 19, pivoted on the standard 20. The projecting end of the lever 19 is connected with a bracket extending from the standard 20 by the spring 21, by which the lever is held in the raised position. The adjusting-screw 22 forms an adjustable stop for the short end of the lever.

The lever 19 is provided with the armature 23. The electro-magnet 24 is secured to the base 25. The spring-contact points 26 are mounted on the insulated support 27. The conductor-wire 28 is connected with the spring contacts-points 26 and forms one arm of an electric circuit. The conductor-wire 29, forming the other arm of the electric circuit, is connected with the electro-magnet 24. The magnet 24 is connected with the base 25 and through the standard 20 with the lever 19, the armature 23 being insulated. If now a passing train depresses the arm 14, the lever 19 is forced between the spring-contacts 26, making a wiping frictional contact, and thus the conductor-wire 28 of one arm of the circuit is connected through the contact-points 26, the lever 19, the standard 20, and base 25 with the conductor-wire 29. The current passing through the wire of the spool energizes the magnet 24 and holds the lever 19, by means of the armature 23, in this position as long as the circuit remains closed.

In Fig. 1, for the purpose of more clearly illustrating the operation, the battery or source of electric energy 30 is shown as placed in the circuit or in the line of the conductor-wire.

29 is a branch wire connecting with arm 32, one of the two arms of the main circuit, and the line 28 is one of two conductors connecting the contact-points of two separate switches with the dynamo, which is connected by a separate conductor-wire 31 with the other arm 33 of the main circuit, as is shown in Fig. 2. The switch proper is shown more clearly in Figs. 5 and 6.

Referring again to Fig. 1, 34 is a post placed on the side of the railroad track, each track being provided with an independent automatic signal system. At such a height above the rail as is best adapted to show the signals to the engineer the case 35 is secured to the post 34. Within this case the electric motor 36 is secured. The end of the driving-shaft of the motor is provided with the pinion 37, which gears with the gear-wheel 38, secured to the shaft 39, which shaft is supported in suitable bearings and is provided with the worm 40, which drives the worm-gear 41, secured to the shaft 42, which shaft is supported in suitable bearings. One end of the shaft 42 extends through the case and has secured to it, outside the case, the arm or semaphore 43. The worm-gear 41 is provided with the pin 44, projecting from one side of the worm-gear, and the pin 45, projecting from the opposite side of the worm-gear 41. The wire 28, from one of the switches operated by the passing train, connects with the post or contact-point 46, and the other wire 28, from another switch operated by a passing train, connects with the post or contact-point 47. The spring-arms 48 and 49 extend from the plate 50 over the contact-points 46 47 on each side of the worm-gear 41, so that when the said worm-gear is turned the pins 44 and 45 will at certain predetermined intervals raise the spring-arms one at each time off from the contact-points 46 47 and break the circuit. In the normal condition both of the spring-arms 48 49 are in contact with the posts 46 47, and the plate 50 is connected with the electromotor 36 by the conductor-wire 51.

Considering now the operation of the devices, as shown in Fig. 2, in which the electric motor is connected with two switches constructed to be operated at points on either side of the signal-operating mechanism, and having the details of the mechanism shown in Figs. 1, 3, 4, 5, and 6 in view, it will be seen that a train passing from the left hand of Fig. 2 to the right will close the circuit by connecting the branch conductor-wire 29 connected with the arm 32 of the circuit of the left-hand switch through the spool of the magnet 24, the base 25, the standard 20, the lever 19, and contact-springs 26, with the conductor-wire 28, and by the same through the post 47, spring-arm 49, and conductor-wire 51 with the electromotor 36, which is connected by the branch conductor-wire 31 with the other arm of the circuit. The electric energy will

now operate the motor 36, which, whenever placed into the circuit will revolve, and always in the same direction, namely, to the right. The mechanism will turn the worm-gear 41, and with it the semaphore 43 on the outer end of the shaft, from the vertical position shown in solid lines to the horizontal position shown in broken lines, when the pin 45 will raise the spring-arm 49 off from the contact-post 47 and break the circuit, stopping the motor, demagnetizing the magnet 24 of the left-hand switch, and permitting the spring 21 to raise the lever to the normal position shown in Fig. 1. When now the train reaches the next or right-hand switch in Fig. 2, the arm 14 will be depressed, the lever 19 will enter between the contact-points 26, the conductor-wire 29 will be connected through the switch with the conductor-wire 28, and this through the post 46, the spring-arm 48, and wire 51 will place the electromotor 36 in the circuit through the branch conductor-wire 31. The electric motor will operate, through the mechanism, the arm or semaphore 43 by turning the same through three-quarters of a circle until the semaphore is in the vertical position, as shown in solid lines in Fig. 1. In this position the pin 44 on the worm-gear will raise the spring-arm 48 off from the post 46, and by thus breaking will stop the electric motor and release the switch. Each switch is connected with two signal-operating devices by the conductor-wires 28, connecting the contact-springs 26 with the post 46 in one direction, and with the post 47 of another signal-operating device in the opposite direction. In practice the switches are placed near each signal-post; but the switch near the post is not connected with that post, but is connected with the signal on the next post in advance of the switch, and with the signal on the next post in the opposite direction, so that a passing train will on passing over the arm 14 of any switch connect the circuit with the electromotor in advance of this switch on the further end of the section or block, and thus cause the block-signal to be displayed at this end, while the same switch will also close the circuit and cause the electromotor on the rear end of the section over which the train has just passed to move the block-signal to the "open" or "safe" signal.

Fig. 11 clearly illustrates the operation of this system. The locomotive of the train is shown on the switch opposite the second signal-post on the left of the figure. Thus having closed the circuit the semaphore on the first post in the figure is shown as set to "blocked" or "danger," and the signal or semaphore on the post at the curve in the rear of the train is set to "open" or "safe," the signals or semaphores of the posts at the right hand of the figure being set at "open" or "safe" as no train is on the track between the signal-posts. The two upper conductor-wires shown on the posts on each side of the figure are the two arms 32 and 33 of the main circuit, and the two lower wires are the wires 28, extending from the spring-contacts 26 of each switch to the posts 46 and 47 of the signal mechanism at the two posts on the ends of the two sections or block extending from the switch in opposite directions. The signal-arm 43 when in the vertical position enters into a protecting-case, which is usually painted white, while the arm is painted red, black, or some other color readily distinguishable when the arm or semaphore is projected from the case.

In place of the arm 43 moving in a vertical plane, the signal or semaphore shown in Figs. 8 and 9 and turning in a vertical plane may be used, operated by the same mechanism as is shown in Figs. 1, 3, and 4, with the difference that the shaft of the worm-gear, on the outer end of which the signal-arm or semaphore is secured, is placed in a vertical instead of a horizontal position. The electromotor may be placed under the signal-operating mechanism for operating either of the two forms of signals, the same as is shown in Fig. 7 for operating the signal turning on a horizontal plane, in which a well-known form of signal consisting of the disk 52 and the arms 53, placed at right angle to each other, are supported on the end of the shaft 42 of the worm-gear 41 above the case 35. As this signal is designed to turn one-fourth of a circle at each operation, the worm-wheel is provided with two pins 44 for raising the spring-arm 48 and two pins 45 on the opposite face of the worm-wheel for raising the spring-arm 49. These pins are placed so that a line from one to the other of the two pins 44 will be at right angle to a line drawn from one to the other of the two pins 45, and the electromotor will turn the worm-wheel at each time one-quarter only.

For the purpose of making this system of automatic signals available for night service the signal-posts are provided with either the lantern 54, in which is secured the incandescent lamp 55, as is shown in Figs. 8 and 9, the arc light 56, as is shown in Fig. 11, or the incandescent lamp may be used in place of the arc lamp on either form of signal. The lamps are cut in or cut out by means of the cam 57, secured on the shaft 42 of the worm-wheel 41. The conductor-wires 58 connect the contact-springs 60 with the conductor-wire 32, forming one arm of the main circuit and with one pole of the electric lamp, while the conductor-wires 59 connect the contact-springs 61 with the conductor-wire 33, forming the other arm of the main circuit, and with the opposite pole of the electric lamp. (See Fig. 2.) The cam 57, which is of insulating material, having two metal contact-plates, by which the two arms of the circuit connected with the spring-clamps 60 and 61 are closed, rotates with the shaft 42 and with the signal or semaphore and passes between the spring-contacts 60 and 61, thus cutting in the lamp and displaying the light, preferably at the same time and during the time the signal is set

at "danger" or "closed;" but the cam 57 may be arranged to operate so that the light is displayed to indicate "open" or "safe." In the arrangement of semaphore shown in Figs. 1, 2, 3, and 4 one cam 57 only is required to display the light simultaneously with the day-signal. In the semaphore shown in Figs. 7, 8, and 9 two cams 5 7 are required, which may be formed on one boss, the cams projecting on opposite sides.

It is evident that many modifications in the construction of the details of the mechanism may be made without departing from the essential feature of the use of the electromotor for operating the signals, the means for automatically breaking the circuits and stopping the motor, and the connections by which the motors are set in motion to operate the signals automatically by the passing train.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a railroad-signal, the combination, with the main-circuit conductors, a fixed source of electrical energy, an electromotor, and an electric light in a circuit controlled by the motor connected with one of the main-circuit conductors, of a switch automatically actuated by means independent of the source of energy to make and break the circuit between the motor and the source of energy, a semaphore and operating mechanism therefor intermediate the semaphore and the electric motor, a second switch in the circuit actuated by the movement of the semaphore to cut out the motor, and the connections intermediate the switch and the electric motor, the whole forming a complete metallic circuit, whereby when the switch is actuated the motor is started and stopped.

2. The combination, with a railroad and a switch mechanically actuated by the passage of a train to make and break the circuit through a motor, of an electric motor, an electric light in a circuit controlled by the motor, a stationary and constantly-charged source of electrical energy, mechanism for operating a signal by the motor, a second switch in the circuit actuated by the signal to cut out the motor and connections between the main circuit, the motor, and the switch, the whole forming a complete metallic circuit constructed to operate the signal and lights at a distance from the switch, as described.

3. A railroad block-signal consisting of signals located at the end of each section or block, a stationary and permanently-charged source of electrical energy, electric lights, electric motors, mechanism connecting the motors with the signals, switches located near the end of each section or block, and connections between the switches, the motors, and the electric circuit-conductors, all arranged so as to connect the motors with the circuit and operate the signal and light in advance of and in the rear of a passing train, as described.

4. The combination, with a semaphore-signal, a stationary and constantly-charged source of electrical energy, an electric motor, mechanism for operating the semaphore and automatically stopping the motor when the semaphore has moved to the desired position, and a railroad, of two switches placed one on each side and at any desired distance from the signal, each constructed to be operated automatically by a passing train, and the connecting conductor-wires between the switches, the motor, and the main circuit, and the connecting-wire between the switches, all arranged so as to start the motor and operate the signal in advance of the passing train by one of the switches, and after passing the signal start the motor and operate the signal by the other switch automatically, as described.

5. The combination, with a semaphore-signal, an electromotor, and operating mechanism intermediate between the motor and the signal, as described, of an electric lamp, a switch operated by the motor, conductor-wires connecting the motor and lamp with the main circuit, and a switch or switches for closing the circuit and starting the motor, as described.

6. The herein-described system of automatic railroad-signals, the same consisting of a series of semaphore-signals placed at intervals along a railroad, a series of electric lights, electromotors connected by mechanism with the semaphores, said mechanism consisting of a circuit-breaker to automatically stop the motor when the semaphore is placed in the predetermined position, switches placed near each semaphore-signal connected with two signal-operating motors in opposite directions, and a main circuit connected with a stationary and constantly-charged source of electric energy with the motor, and the switches constructed to successively start each motor and display a semaphore in advance of the moving train and drop a semaphore in the rear of the train and start the motor at the rear end of the section or block when the train leaves the section or block to operate the signal, and to light and extinguish the electric lights, as described.

7. A railroad-signal system consisting of semaphores, a stationary and constantly-charged source of electrical energy, electric lamps and electromotors for operating the semaphores and lamp cut-outs, placed at intervals along a railroad, connected with switches operated automatically and mechanically by the passing train, and with a main circuit constructed to display a semaphore, and an electric light at each end of each section or block occupied by the train, as described.

8. In a railroad-signal, the combination, with the curved arm 14, the lever 19, the standard 20, spring 21, base 25, magnet 24, armature 23, and contacts 26, of the electric motor 36, the semaphore 43, and intermediate mechanism for operating the semaphore by the motor, and the conductor-wires connecting

the motor and switch with the main circuit constructed to automatically connect the motor with the circuit by the passing train, as described.

9. The combination, with the electromotor 36, the pinion 37, the gear 38, the shaft 39, provided with the worm 40, the worm-gear 41, provided with the pins 44 and 45, the shaft 42, and semaphore 43, of the contact-posts 46 and 47, the spring-arms 48 and 49, two switches located at points in opposite directions from the signal and operated automatically by the passing of a train, and conductor-wires connecting the electromotor and switches with the main circuit constructed to operate the signal, as described.

10. The combination, with the motor 36, the shaft 42, and the disk 41, secured to the shaft 42 and provided with the pins 44 and 45, and intermediate operating mechanism between the motor and the shaft 42, of an electric lamp, the cam 57, secured to the shaft 42, the contacts 60 and 61, switches operated by the passing of a train, and conductor-wires connecting the electric lamp, the motor, and switches with an electric circuit, as described.

11. The combination, with the shaft 42, provided with a day-signal or semaphore, of the cam 57, the contacts 60 and 61, the worm-gear 41, provided with the pins 44 and 45, the worm 40, shaft 39, gear 38, pinion 37, and motor 36, two switches constructed to close a circuit automatically by a passing train, located in opposite directions from the above signals and connected with the main circuit and with the contact-posts 46 and 47, the arms 48 and 49, and conductors connecting the motor and lamp with the main circuit, constructed to operate the signal and display the light, as described.

WILLIAM D. SHELDON.

Witnesses:
M. F. BLIGH,
J. A. MILLER, Jr.