(No Model.)

J. B. STEWART.

AUTOMATIC SIGNAL APPARATUS.

No. 462,513. Patented Nov. 3, 1891.

Fig. 1.

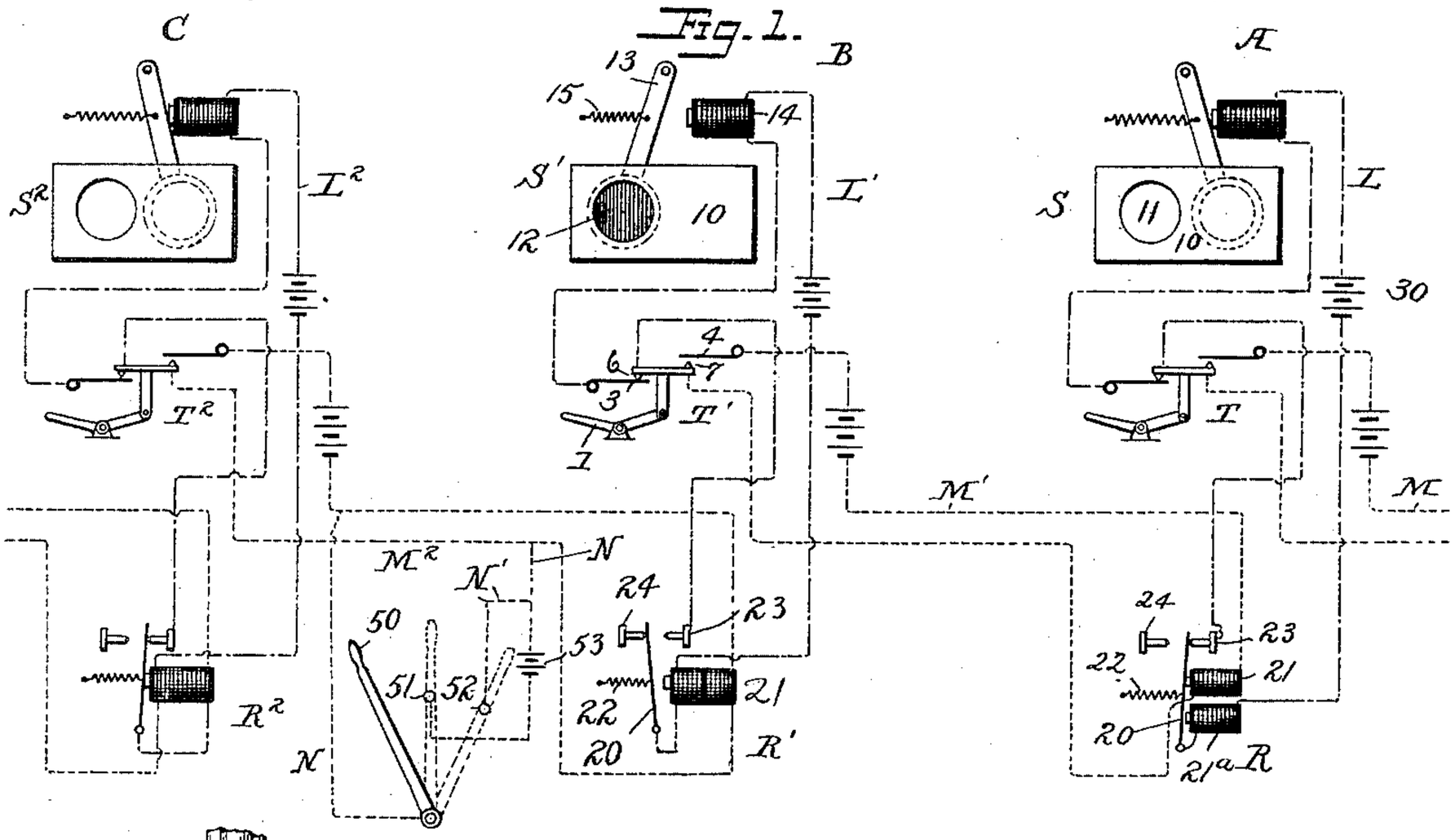


Fig. 2.

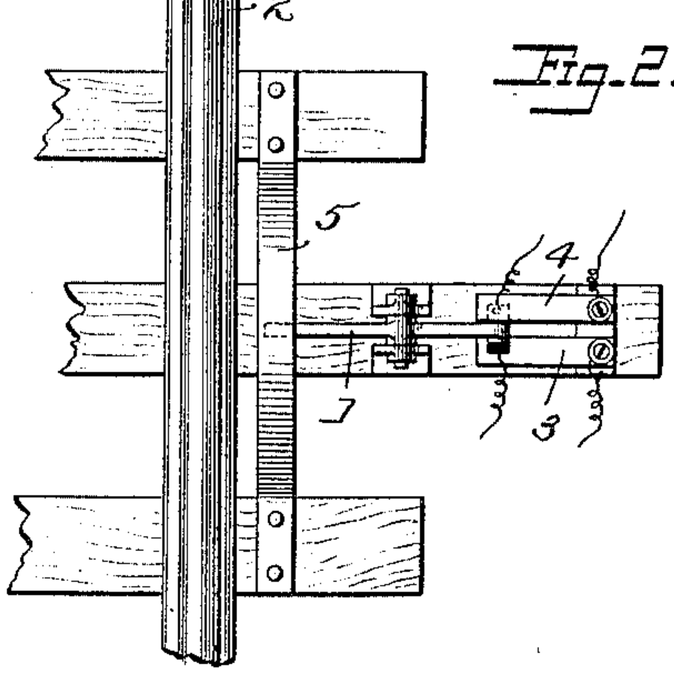


Fig. 3.

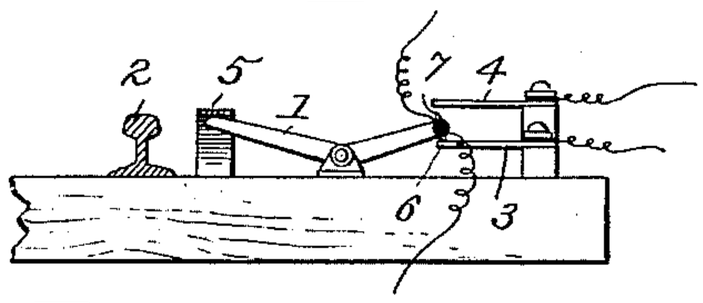


Fig. 4.

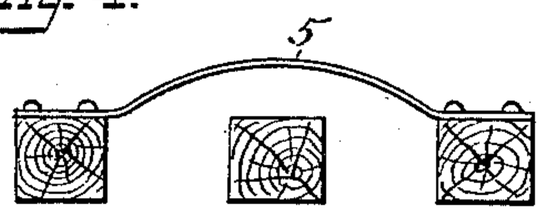


Fig. 6.

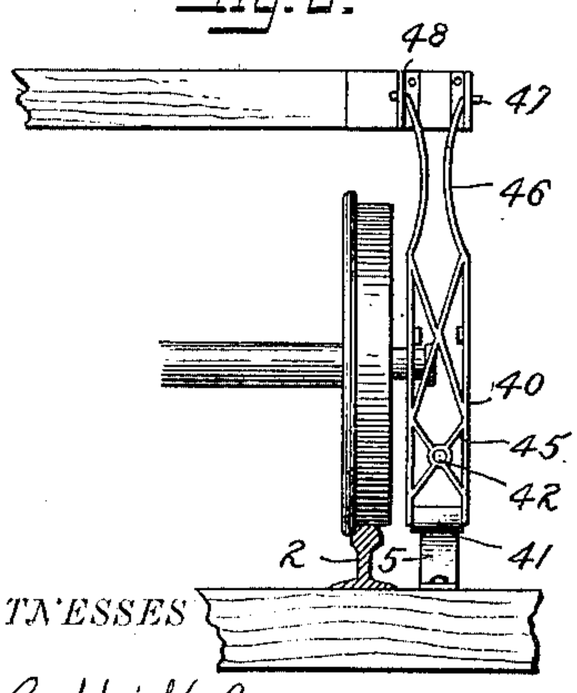
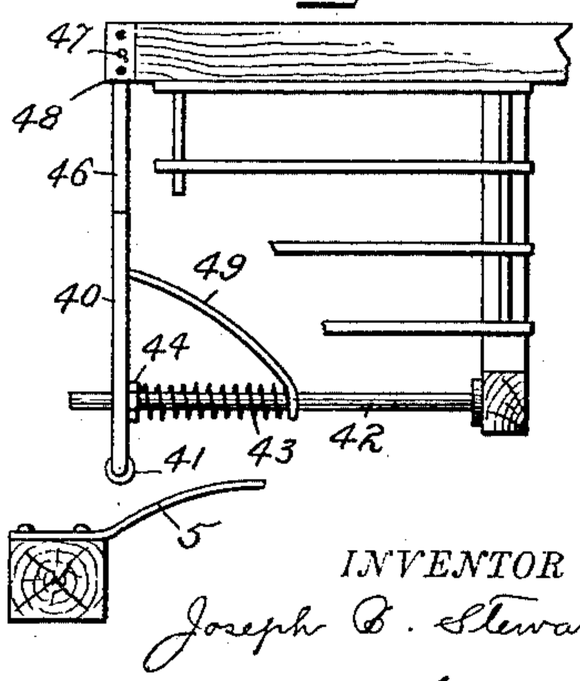


Fig. 5.



WITNESSES

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AUTOMATIC SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 462,513, dated November 3, 1891.

Application filed December 23, 1890. Serial No. 375,612. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH B. STEWART, a citizen of the United States, residing at Haverstraw, in the county of Rockland and State of New York, have invented certain new and useful Improvements in Automatic Signal Apparatus, of which the following is a specification.

My invention relates to railway block signals; and it consists in an improved construction and arrangement of devices and electrical connections, together forming an automatic block signal system.

In the accompanying drawings, in which like letters represent like parts throughout the several views, Figure 1 is a diagram showing the general arrangement of instruments and circuits. Figs. 2, 3, and 4 are plan and side views of the track-instrument, and Figs. 5 and 6 are partial side and end views of a car having my improved contact-arm attached thereto.

In my present invention the movements of the signals are entirely automatic and controlled by the movements of the trains. For instance, when a train enters upon a block it sets a "danger-signal" at that end of the block to warn following trains and such signal remains displayed until after the train leaves the block, when it sets a danger signal at the beginning of the next block and immediately thereafter causes the first signal to indicate that the first block is clear.

Fig. 1 of the drawings illustrates in diagram three sections A, B, and C and two intervening blocks. The equipment at each station consists of a suitable signal adapted to be operated electrically, a normally-closed local circuit for moving the signal, a track-instrument adapted to break the local circuit and thereby set the signal at "danger," and a relay in the line-circuit from the next succeeding station for completing the local circuit to reset the signal at "safety" when the train has passed into the next block.

The particular forms of the above instruments which I shall describe are not essential to the operation of my improved system, as equivalent devices may be used; but they are such as have been found most satisfactory in practice. In the track-instruments T T′ T^2 a lever 1, having its fulcrum upon a fixed part of the track, is arranged with its inner end near the rail 2 and its outer end between two electrical contacts 3 4, upon the former of which it normally bears by virtue of its weight or a spring. The inner end of the lever is preferably protected by a spring-plate shield 5, which will be pressed down by a tappet upon the rear end of each train as it passes, thus moving the lever.

Upon the outer end of the lever are two contact-points 6 7, respectively, opposite the contacts 3 4. The contacts 3 6 are arranged in the local circuit and are normally closed, while the contacts 4 7, which are normally open, are arranged in the line-circuit extending to the next station in the rear.

The signals S S′ S^2, as shown, consist each of a shield 10, having an opening 11 and a swinging colored target 12 (usually red) arranged behind the shield so as to swing to and from the opening 11. Upon the rod by which the target is suspended is an armature 13, and adjacent thereto is an electro-magnet 14, which is included in the local circuit. Opposite the armature is a spring 15 to retract the target when the circuit is broken.

R R′ R^2 are relays, each in the line-circuit extending to the next succeeding station and designed to close the local circuit when the line-circuit is closed. The relay consists of a pivoted armature 20, having on one side an electro-magnet 21 and on the other a retracting spring 22. At the free end of the armature there is a contact 23 upon one side and a stop 24 upon the other.

The electrical connections consist of a series of local circuits L L′ L^2 and a series of line-circuits M M′ M^2, each provided with a suitable battery 30 or other source of electricity. Each local circuit passes through magnet 14 of the signal, contacts 3 6 of the track-instrument contact 23, armature 20, magnet 21 of the relay, and back to battery. Each line-circuit passes through contacts 4 7 of a track-instrument at one station and through the relay-magnet 21 at the preceding station and back to battery.

Instead of running both circuits through

magnet 21, I may use a separate magnet 21ª for the local circuit, as shown at station A, Fig. 1.

The operation of the devices thus far described is as follows: The local circuits are normally closed and the targets held at "safety" by magnets 14, the magnets 21 holding the armatures 20 to the contacts 23. The line-circuits are normally open at the track-instruments. When a train passes a station, as B, the local circuit is momentarily broken at the track-instrument and the target drops to "danger," while at the same time the circuit becomes broken at 23 and remains so until the train has passed off of the block. When the train passes off of the block it operates the track-instrument at C, first setting the danger-signal S^2 and afterward closing circuit M^2, which operates the magnet 21 at station B, closes local circuit L', and sets signal at "safety" at station B. It will thus be seen that the operation of the system is entirely automatic and that the danger-signal in the rear of a train is not withdrawn until after the succeeding danger-signal is set.

In Figs. 4 and 5 I have illustrated an improved form of tappet attached at one side of the rear end of a car (which should be the rear car of the train) for operating the track-instruments. A roller 41 is carried at the lower end of a frame 40. The lower portion of the frame is strengthened by diagonal bracing 45, while the upper portion consists simply of the side pieces 46, curved inward and forming spring-arms which bear upon their upper extremities pintles or journals 47, which support the frame. The tappet is vertically adjustable by means of a series of bearings 48, into which the pins 47 may be sprung. A rod 42 is attached at one end to the framework of the car and its other end passes through the lower end of the frame 40, which abuts against a nut 44 upon said rod. A brace 49 is pivotally attached to the upper portion of the frame and its lower end fits loosely about the rod 42, so as to slide thereon. A spring 43 is interposed between the nut 44 and brace 49, which tends to hold the frame against the nut, while at the same time permitting it to swing back if it meets with any obstruction or if it should be adjusted too low for the track-instruments. The spring 43 should be sufficiently strong to cause the tappet to operate the track-instrument before permitting it to swing back. The tappet being upon the rear end of the train, the danger-signal for a block can only be withdrawn when the entire train has left the block.

In case of accidental interruption of a local circuit its signal will drop to "danger" and remain so until the defect is remedied. Should a line-circuit become interrupted, the first approaching train will be permitted to pass, but the signal in the rear of the defective line-circuit will remain at "danger," as set by said train, until the defect in the line-circuit is removed. It will thus be seen that an accident cannot occur due to any defect in the electrical connections, inasmuch as a defect in the local circuit always causes the danger-signal to be displayed, and a defect in the line-circuit will permit but one train to pass, thus precluding all possibility of collisions by preventing a second train from entering the block.

When there is a switch located in a block, I provide means, as hereinafter described, for throwing the signal in the rear of the switch to "danger" whenever the switch is opened and for preventing the safety-signal being again displayed until the switch is closed. A branch circuit N, having a battery 53, is tapped onto the line-circuit M^2 of the block, in which a switch is located. One terminal of this circuit is connected to the switch-lever 50 or other movable contact connected to the switch, while the other terminal is connected to a contact 51, arranged in the path of the movable contact 50, in position to close the circuit while the switch is being opened. The relay-magnet at R' is arranged in both circuits M^2 and L' and reversely wound, so that both circuits acting at once will neutralize each other, while either circuit acting alone will hold the armature 20 against the contact 23. A branch N' of the circuit N, extending to a contact 52, cuts out the battery 53 when the switch is fully opened, so that the movable contact 50 closes with the contact 52. This branch when closed also short-circuits the line-circuit M^2 and the relay-magnet at R'.

In operation, when the switch is opened the circuit N is closed through contact 51 and the current from battery 53 will neutralize the magnet at R', thus releasing armature 20 and allowing the signal at B to drop to "danger." As the switch is fully opened, the circuit N is broken at 51 and the branch N' closed at 52. The effect of this is to short-circuit line M^2 and prevent the signal at B being set to "safety" by the track-instrument at C while the switch remains open. As the switch is closed the circuit N, which is again momentarily closed at 51, causes the magnet at R' to attract the armature 20, thus closing local circuit L' and setting signal at B again at "safety."

Without limiting myself to the precise construction and arrangement of parts shown and described, I claim—

1. In a block signal system, a series of electrically-operated signals, a series of normally-closed local circuits, each including a signal, a series of normally-open line-circuits, a series of track-instruments, each adapted to open a local and close a line circuit upon the passage of a train, and a series of relays in the line-circuits for closing the local circuits, the line-circuits being normally open at the track-instruments, substantially as described.

2. In a block signal system, a series of stations, each having a signal which is normally held at "safety" by an independent nor-

mally-closed local circuit, a line-circuit extending to the preceding station and open only at said station, and a track-instrument adapted upon the passage of a train to first open the closed signal-circuit to display the danger-signal and afterward to close the line-circuit, whereby the signal-circuit at the preceding station is closed and the signal changed to "safety," substantially as described.

3. In a track-instrument, a curved spring-metal shield to receive an impact from a passing train, a lever carrying two contacts arranged to be operated by said spring, and two fixed contacts, one movable contact being normally in circuit with a fixed contact and the other contacts being normally separated, substantially as described.

4. A device for operating track-instruments, consisting of a frame 40, pivotally connected to the rear end of a train and carrying a roller at its lower end, a rod 42, spring 43, nut 44, and brace 49, substantially as described.

5. In a device for operating track-instruments, the frame carrying a roller at its lower end and having spring-arms at its upper end bearing pintles, and a pair of eyes arranged upon a car to receive said pintles, substantially as described.

6. In a block signal system, the combination, with the normally-closed local circuit and the normally-open line-circuit and the relay-magnet included in both of said circuits, of the branch circuit N, including a track-switch and connected to operate the relay, substantially as described.

7. In a block signal system, the combination, with the normally-closed local circuit and the normally-open line-circuit and relay-magnet included in both of said circuits, of the branch circuit N, including a track-switch, a battery in said branch, and connections controlled by said switch for opening and closing said branch circuit and operating the relay, substantially as described.

8. In a block signal system, the combination, with the normally-closed local circuit and the normally-open line-circuit and the relay-magnet included in both of said circuits, of the branch circuit N, including a track-switch and connected to operate the relay and the short circuit N′, substantially as described.

9. In a block signal system, the combination, with the normally-closed local circuit and the normally-open line-circuit and relay controlling the signal included in both of said circuits, of the branch circuit, including a track-switch and operating to neutralize the relay-magnet, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH B. STEWART.

Witnesses:
JAS. S. MCCULOH,
A. KETCHUM.