(No Model.) 2 Sheets—Sheet 1.

A. S. McCASKEY.

RAILWAY BLOCK SIGNALING SYSTEM.

No. 498,290. Patented May 30, 1893.

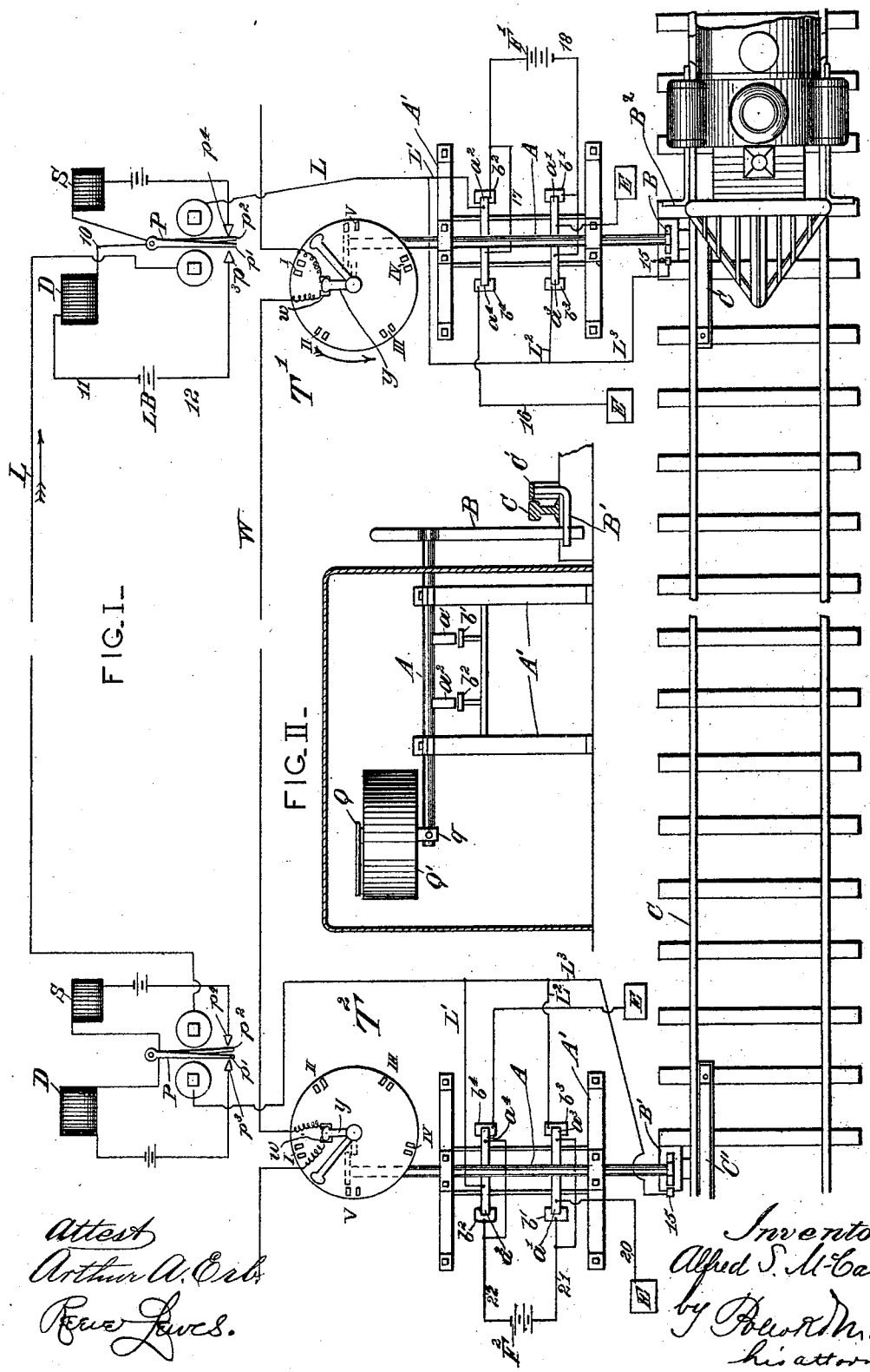


FIG. I.

FIG. II.

Attest
Arthur A. Erb
Rene Lewis.

Inventor.
Alfred S. McCaskey
by Poole & Mann,
his attorneys.

(No Model.) 2 Sheets—Sheet 2.

A. S. McCASKEY.

RAILWAY BLOCK SIGNALING SYSTEM.

No. 498,290. Patented May 30, 1893.

FIG. V.

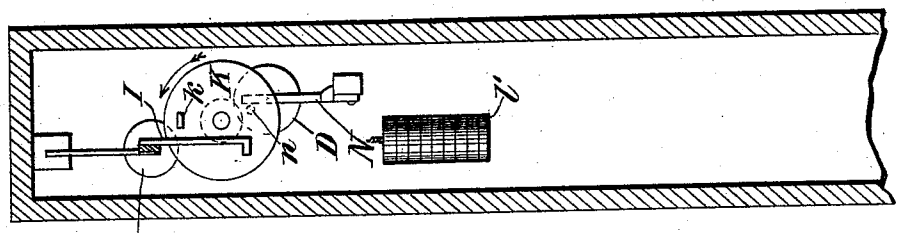


FIG. IV.

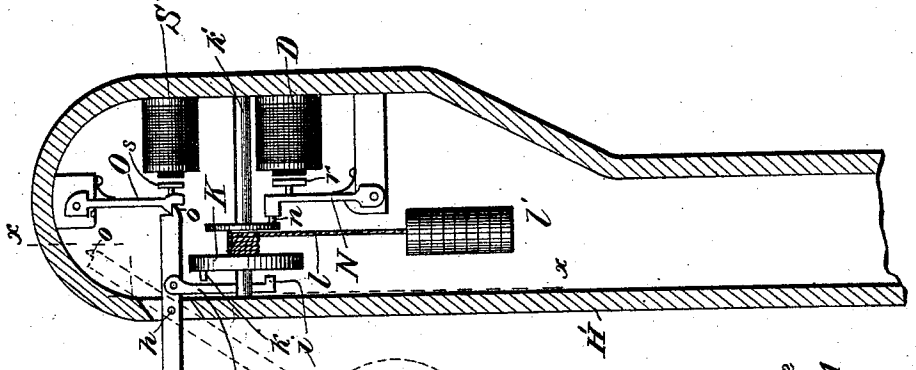


FIG. VI.

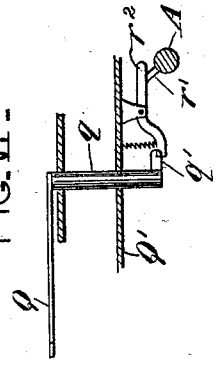


FIG. VII.

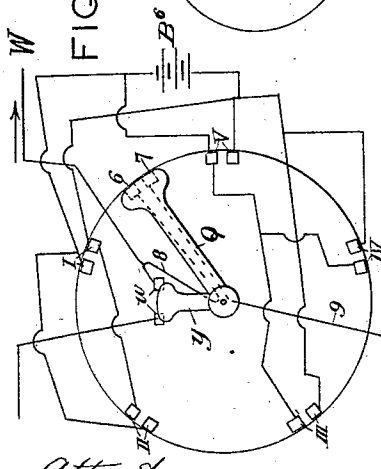
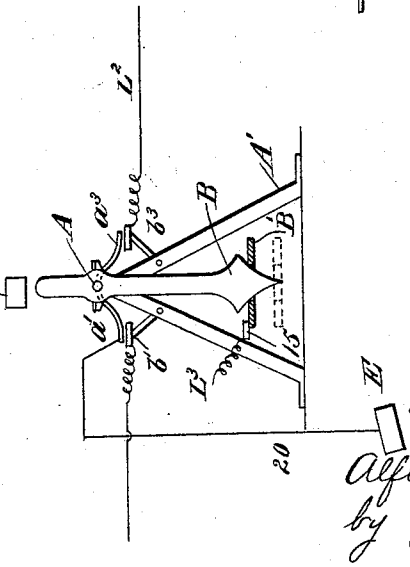


FIG. III.



Attest.
Arthur W. Eab
Reuv Lewis.

Inventor.
Alfred S. McCaskey.
by Pollok & Maurs
his attorneys.

UNITED STATES PATENT OFFICE.

ALFRED S. McCASKEY, OF CHICAGO, ILLINOIS.

RAILWAY BLOCK-SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 498,290, dated May 30, 1893.

Application filed July 29, 1892. Serial No. 441,590. (No model.)

To all whom it may concern:

Be it known that I, ALFRED SAMUEL MCCASKEY, of Chicago, Illinois, have invented a new and useful Improvement in Railway Block-Signaling Systems, which is fully set forth in the following specification.

The present invention relates to block signaling apparatus for use on railway systems.

In an application of even date, Serial No. 441,589, I have described a system of electrical signaling, and since some parts of the present invention are similar in construction and operation to corresponding parts of the said system of electrical signaling, it is to be understood that such devices as are common to the two applications are not claimed herein, this application being intended to relate specifically to railway signaling.

The functions to be performed by the apparatus hereinafter described are (first) to operate automatically a semaphore, or other suitable signal as the train passes from one section or "block" to the next, exhibiting the danger signal indicating that such block or section is occupied; (second) to restore automatically the semaphore or signal to "safety" as the train leaves the block; (third) to report to the train-dispatcher's office the movement of every train from one block to another, the signal transmitted being such as to indicate the number designating the block which the train has left and that which it enters.

The object of the invention is to accomplish these results by mechanism which shall be both reliable and simple, and in fact to eliminate, so far as possible, all liability of accident due to derangement of apparatus, or carelessness of operators, it being understood that the operation of the entire system is automatic. The track is, as usual, divided into sections or blocks of convenient length, and at the extremities of each block is a semaphore adapted to give the usual conventional signals representing "danger" or "safety," according as the block is occupied or not. Each semaphore has electro-magnetic controlling mechanism whereby it can be moved from one of its positions to the other. I provide for operating the semaphore by a motor, the simplest form being a weight which can be wound up at intervals by any electrical winding mechanism, or mechanically, by the movement or weight of passing trains. I provide two magnets, which may be termed the "danger magnet" and the "safety magnet." The former when energized releases the weight or motor allowing its arbor to make one turn. This motion is utilized to lift the semaphore arm which a catch engages and holds in its raised position. The safety magnet when energized retracts the aforesaid catch and the arm drops by gravity to its normal position. The work to be done by the magnets is therefore very slight, and the current required proportionately small. The safety magnet at one end of the block is in the same circuit with that at the opposite end, and so of the two danger magnets, so that the pair of semaphores guarding any block move simultaneously.

The invention contemplates the use of only a single wire connecting the two ends of the block, and it will be observed that there are four different movements to be noted; viz: (first) the movement of a train into a block in one direction, (second) its exit from the block in the same direction, (third) a movement into the block in the opposite direction, and (fourth) its exit in the direction last assumed. Movements one and three must set both signals at danger, and movements two and four must restore both signals to safety. These results are accomplished by an arrangement of batteries, circuits, circuit-controllers and polarized relays, which will be explained in detail hereinafter.

The circuit-controllers are normally locked in a position which leaves all the circuits open. The weight of the engine in passing the point where the block begins or ends momentarily releases the circuit-controller, and a projection, properly placed, on the engine tilts it in one direction or the other, closing circuits and energizing the proper magnets. If the train is passing into the block the main-battery will be closed to line in such manner as to send an impulse in a certain direction through polarized relays at both the terminals of the block. The polarized relay will thereupon close the circuits of the danger magnets with the result given above. When the train passes out of the block it causes a reverse current to traverse the line, closing the circuit of the safety magnets. I

prefer to use a polarized relay such as described in my aforesaid application, since it would require two relays of the ordinary form at each station to effect the desired operations.

To signal the train dispatcher's office I place at each station along the line, a rotary circuit maker, preferably of the type described in my aforesaid application, but adapted to give a certain definite signal, composed of a group of impulses, there being of course a different signal assigned to each station. The train dispatcher's office being equipped with a receiving mechanism of the kind described in my said application, the motion of every train is duly reported, and if desired recorded.

As stated the train signal mechanisms for each block are coupled in pairs, one mechanism being at each end of the block. As one block begins where another ends there would be, at each point where two blocks meet, two sets of train signal mechanisms, and it is advantageous to arrange these so that the blocks overlap, so that the train enters and sets the danger signals of one block before it leaves and sets safety signals of the other. It is not necessary that a separate signal be sent to the train dispatcher's office from both the signal mechanisms at a meeting point. I therefore arrange the apparatus in such manner that the reporting mechanism is only actuated by the movement of a train out of the block, this part of the mechanism not being put in operation when the train passes it in the direction to enter the block.

In the accompanying drawings which form part of this specification I have illustrated a system arranged in accordance with the invention.

Figure I, is a plan view, partly diagrammetric illustrating the general operation of the system, and showing one pair of signal devices, supposed to be located at opposite ends of a block. Fig. II, is a side elevation of a local station apparatus. Fig. III, is an end elevation looking at the locking arm. Fig. IV, is a sectional elevation of the semaphore and its operating mechanism, and Fig. V, is a sectional elevation on line x—x. Fig. VI, is a detail of the signal transmitting release mechanism. Fig. VII, is a detail, illustrating the operation of signaling to a central office the passage of a train.

A, is the circuit-maker, shown in the form of a rock-shaft journaled in supports A′, and carrying four contact springs a', a^2, a^3, a^4, two on each side, adapted to make contact respectively with four fixed contact plates b', b^2, b^3, b^4. In the normal condition of the system none of these springs are in contact with the corresponding plates.

B is a locking arm suspended from shaft A and its wedge shaped lower end is held firmly in a slot in the locking plate B′, which passes under the rail C between the cross-ties and is secured to a powerful tread-spring C′ of such strength that it requires a great weight, such as that of the engine, to depress it. The tread spring is arranged in the path of the ordinary wheel, or it may be of a special wheel, so that the circuit-maker will not be unlocked by every wheel of the train. When the tread spring is thus depressed, shaft A is released, and a projecting arm B^2 on the engine striking the upper end of arm B rocks shaft A in the direction in which the train is moving, closing the contacts on that side. Shaft A immediately resumes its normal position by the weight of arm B, and by the return of the tread spring. The motion of the latter should not be great enough to permit the escape of arm B from the slot in locking plate B′. If the direction of the train is carrying it into the block, the action of the circuit-maker A will be to send to line a current of proper direction to close the circuits of both danger magnets D (see diagram Fig. I); if in the reverse direction the safety magnets S will be energized. The electrical connections of the system will be readily understood from Fig. I. T′ and T^2 represent the terminals of a block or section of track of any suitable length, the apparatus at the two stations being connected by a line wire L. The wire entering a station passes through a polarized relay magnet P having its coils wound in opposite directions and having two tongues or armatures p' p^2 adapted to respond respectively to currents of opposite direction. After passing through the magnet the line branches, one branch L′ terminating at spring a^2, another L^2 at plate b^3 and a third L^3 at plate 15, which is normally grounded through locking plate B′.

F′ and F^2 are the line batteries. That at station T′ has its positive pole connected to plate b^2 and to the opposite spring a^4. The negative is connected to spring a^3 and plate b'. The position of battery F^2 is reversed. The spring a' and plate b^4 at each section are connected to earth, each terminal being indicated by the letter E.

The magnets S and D which operate the semaphore, as will be presently described, are each in a local circuit normally open at the terminus of one of the tongues or armatures of the polarized relay P. Thus, tracing the circuit of danger magnet D at station T′, it proceeds from tongue p' by wire 10 to the magnet, thence by wire 11 to local battery LB, and by wire 12 to the contact point p^3, where the circuit is normally open. A current of proper direction to throw tongue p' against point p^3 will close the circuit of this magnet. The circuit of safety magnet S can readily be traced from tongue p^2 back to contact point p^4.

Let it be assumed that an impulse in the direction of the arrow, Fig. I is to work the danger magnets, and an impulse in the opposite direction is to work the safety magnets, and we will follow the operations that take place as the train passes into the block mov-

ing from terminus T′ toward T^2. In passing T′ the circuit-maker A at that station rocks so as to bring springs a^3 a^4 against plates b^3 b^4 and at the same time the normal earth connection of the line is broken at 15 by the depression of the plate B′. Consequently a circuit is closed from the earth by wire 16 to plate b^4, spring a^4, wire 17, positive pole of battery F′, wire 18, spring a^3, plate b^3, wire L^2, relay P at terminus T′, line wire L, relay at terminus T^2, wire L^3, contact 15 and plate B′ to earth. In other words an impulse flows in the direction of the arrow, causing tongues p' at both relays to close the local circuits of the danger magnets D. The normal condition of the line is immediately restored by the return of shaft A to its usual position; but as will presently be shown the semaphore, when actuated by the danger magnet, remains in the position indicating danger, until the circuit of the safety magnet has been closed. This occurs when the train passes out of the block at terminus T^2. In so passing it tilts shaft A, as before, bringing springs a' a^2 into contact with plates b', b^2. This brings battery F^2 into circuit with its positive pole to earth as follows: from the earth by wire 20 to spring a', to plate b', wire 21, positive pole of battery, wire 22, plate b^2, spring a^2, wire L′, and so on to the earth at station T′. The impulse in this case is the reverse of that sent when the train entered the block, and consequently the circuits of both safety magnets will be operated.

It will be understood from the drawings that when a train enters the block at T^2 moving in the opposite direction to that supposed in the above illustration, an impulse in the direction of the arrow will go to line from battery F^2, with precisely the same results as described above when the train entered the same block in the opposite direction, the battery connections at the two stations being reversed.

The construction of the semaphore is illustrated in Figs. IV and V. The arm H is pivoted at h in a slot of post H′, so that it can assume a horizontal position to indicate danger, or be dropped (as indicated in dotted lines) for safety. To the shorter end of the lever arm H is pivoted a link I having a horizontal projection i, and adjacent to this link is a wheel K having a pin k adapted to engage during its downward motion with projection i. Wheel K is supported on an arbor k', and on the hub of this wheel is wound a cord l supporting a weight l', tending to turn wheel K. The wheel is normally held stationary by a pivoted stop N engaging a pin n on the face of wheel K′. The inner end of arm H has a toe o which, when the arm is raised is caught and held by a spring catch O. D represents the danger magnet whose armature r is attached to stop N, and S represents the safety magnet whose armature s is attached to catch O. When the circuit of magnet D is closed stop N is retracted against the pressure of its spring, wheel K is released and is rotated by weight l', as pin k descends it engages projection i of link I raising the semaphore arm until toe o is caught by catch O. At this moment the pin k passes from in contact with protection i and the wheel completes its revolution being arrested at the end thereof by stop N, which has instantly returned to its normal position. The parts all remain in this position until the exit of a train from the block closes the circuit of safety magnet S. Catch O is thereupon retracted and arm H being unsupported falls by gravity to its original position.

In addition to the line L connecting locally the two terminals T′ T^2 of each block, there is a main line wire W (Fig. I) running into each station and connecting the several stations with a train dispatcher's office. Each station has a signal transmitting apparatus adapted to send a predetermined signal which will of course be different for each other station. The transmitting devices, and the receiving apparatus with which they are connected may be of any suitable description, and the specific form thereof constitutes no part of this invention, there being many known devices that will answer the purpose. The drawings show a rotating circuit closing arm Q adapted to make contact in its rotation with terminals at the points I, II, III, IV, V and send to line negative or positive impulses in predetermined order to represent arbitrarily the signal appropriated to that particular station. This may be accomplished by apparatus of various kinds. As shown in Fig. VII there is a pair of contact plates at each of the points I to V in the path of the rotating arm Q. One plate of each pair is connected with the positive pole of a battery B^6 and the other with its negative pole. Arm Q has at its extremity two contact plates 6 and 7, insulated from each other the former connected by wire 8 with the main line W, and the latter by wire 9 with the earth. The connections at the battery branches being as shown in the drawings a minus impulse will go to line at the points I, II and V, and a plus impulse at the points III and IV. By varying the battery connections with the terminal points on the dial a different combination of impulses can be made up at each station, as will be readily understood. Arm Q is mounted on an arbor q which passes through casing Q′ which may contain clock work or other mechanism for rotating the arbor. When rock-shaft A′ turns in one direction a pin r' (Fig. VI) on the end thereof trips a lever r^2 pivoted to the under side of the casing and releases pin q' on arbor q permitting the latter to make a revolution. When shaft A rocks in the opposite direction the release mechanism is not affected. Consequently a signal is sent to the train-dispatcher's office from one only of the pair of apparatus at the two terminals, preferably from that at the end of the block which the train is leaving.

The line wire W runs at each station to terminal points *w*, across which the circuit is normally closed by a short arm Y also carried by arbor *q*. As soon as arbor *q* begins to rotate this circuit is broken.

The details of the apparatus may be such as described in my application already referred to; but there are many known ways of transmitting distinct signals from stations along a line, and I contemplate the use of any apparatus suitable for this purpose. It is also contemplated that modifications may be made in details and arrangements of the system, and I do not limit myself to any details or arrangements which are susceptible of variation without departing from the spirit of the invention. It is further contemplated that parts of the system may be used without employing the whole, as for example it may not in all cases be deemed of importance to use the means described for signaling to a central office the movements of trains along the line.

Having fully described my invention, what I claim is—

1. In a block-signaling system, the combination with the semaphores or signals at the ends of a block or section of track, of a danger and a safety magnet for each signal adapted to be energized respectively by currents of opposite direction, a line wire connecting the terminal station apparatus, a line battery at each terminal, the connections of the battery at one terminus being the reverse of those at the other and a circuit controller actuated by the passage of a train, and adapted to break the normal earth connection of the line at its station and to send to line currents of either direction according to the movement of the train, substantially as described.

2. In a railway signaling system comprising local block signaling apparatus connected in pairs by line wires, the combination of a circuit-controller at each station adapted to be moved by a passing train in the direction of the latter's movement, a line battery at each station having contacts for connecting either pole to line according to the direction of the circuit-controller's movement, the battery connections at one station being the reverse of those at the other a semaphore or signal at each station, and electro-magnetic actuating mechanism therefor, for indicating danger or safety according to the polarity of the impulses sent to line, substantially as described.

3. The combination with a semaphore or signal adapted to assume two positions to indicate danger and safety, a danger magnet and a safety magnet, each in a separate circuit, polarized switch mechanism for each circuit, one responsive to a positive and the other to a negative impulse, and automatic train-signaling mechanism comprising a line battery and circuits and a circuit controller operated on the passage of a train to send an impulse from said battery to line, the direction of the impulse being determined by the direction of movement of the train, substantially as described.

4. The combination of the rocking circuit-maker, a locking arm normally holding the same stationary, but adapted to be released by the weight of a passing train, a line battery and circuits having terminals on each side of said circuit-maker so as to connect the positive pole to line when the circuit-maker rocks in one direction, and vice versa, a danger magnet and a safety magnet, each in a separate local circuit, and polarized switch mechanism for each circuit responsive respectively to currents of opposite polarity, substantially as described.

5. The combination in a railway signaling system, with local signal apparatus adapted to give signals indicating the passing and direction of a train, of a semaphore, a motor for raising the same, a catch for holding it when raised, a magnet for releasing the motor, a second magnet for releasing said catch, and means as indicated for closing the circuit of each magnet when its appropriate current is thrown upon the line, substantially as described.

6. The combination of the pivoted semaphore arm, a wheel having a projection for engaging and raising said arm, said wheel being normally held stationary by a detent, means for rotating said wheel when released, a magnet for effecting such release, a catch for holding said arm when raised, a magnet for withdrawing said catch, and means for closing the circuit of each of said magnets, substantially as described.

7. The combination with the local signaling apparatus, comprising a semaphore, electro-magnetic actuating mechanism therefor, and a circuit-controller normally locked, but adapted to be released and actuated by the passage of a train, of a signal transmitting device at each station operated by the movement of said circuit-controller, said transmitting devices being all connected in a line leading to a central office, substantially as described.

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

ALFRED S. McCASKEY.

Witnesses:
PHILIP MAURO,
REEVE LEWIS.