C. J. COLEMAN.

RAILWAY TRAFFIC CONTROLLING SYSTEM.

APPLICATION FILED JULY 30, 1910.

1,114,118.

Patented Oct. 20, 1914.

2 SHEETS—SHEET 1.

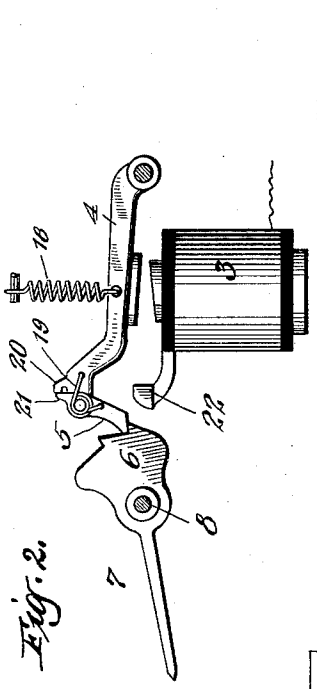


Fig. 2.

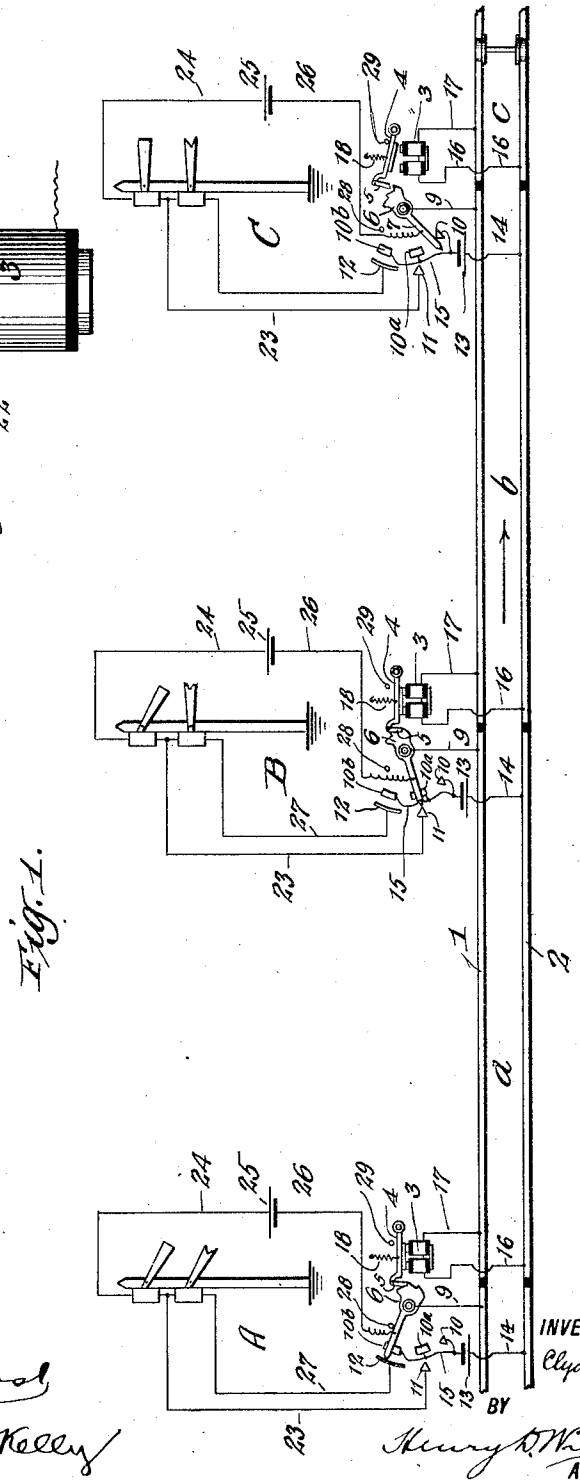


Fig. 1.

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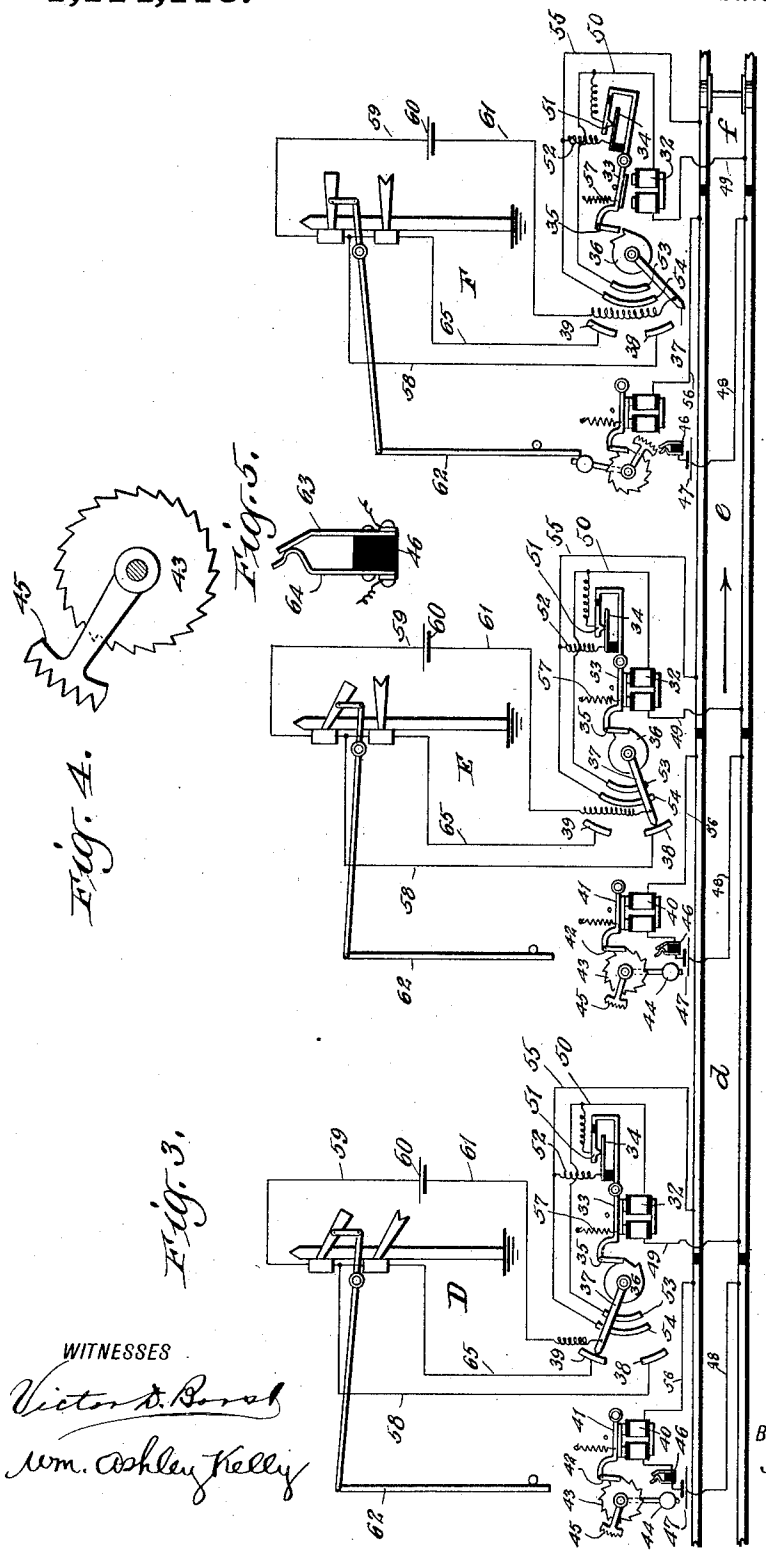


Fig. 4.

Fig. 5.

Fig. 3.

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UNITED STATES PATENT OFFICE.

CLYDE J. COLEMAN, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO HALL SWITCH & SIGNAL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

RAILWAY-TRAFFIC-CONTROLLING SYSTEM.

1,114,118. Specification of Letters Patent. Patented Oct. 20, 1914.

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To all whom it may concern:

Be it known that I, CLYDE J. COLEMAN, a citizen of the United States of America, residing in the borough of Manhattan, city of New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Railway-Traffic-Controlling Systems, of which the following is a specification, reference being had therein to the accompanying drawings, forming part thereof.

My invention relates to railway traffic-controlling systems, and particularly to electric automatic signaling systems.

The general object of my invention is to provide a safe, reliable, efficient and economical railway traffic-controlling system, of the type known as wireless, wherein the connection from signal to signal is effected through the track rails as conductors.

Broadly my invention comprises what I term a step-by-step device in control of the traffic-controlling means together with an electric circuit in control of the step-by-step device, and means for producing in the electric circuit the impulses which control the step-by-step device, such means being under the control of a moving railway vehicle.

As specifically embodied in the system illustrated in the drawings, my invention includes the employment of what I term a "step-by-step" device, in control of the traffic-controlling or signaling means, which, when actuated a predetermined number of steps, will control the operation of the home signal and, when actuated an additional predetermined number of steps, will control the clearing operation of the distant and home signals; together with a track circuit in control of the step-by-step device and arranged to give the first impulse to the device for clearing the home signal when a train passes off the track circuit of the block guarded by that signal; and means for temporarily interrupting the track circuit to give the second or home-and-distant clearing impulse to the step-by-step device when the home signal in advance is cleared.

Another object of my invention is to provide means for assuring the second or home-and-distant clearing impulse of the step-by-step device, irrespective of the movement of the home signal in advance.

Other objects and advantages of my invention will appear from the following description.

I shall now describe my invention with reference to the accompanying drawings and shall thereafter point out my invention in claims.

Figure 1 is a diagram of a traffic-controlling system embodying my invention, showing two complete blocks and portions of blocks in advance and rear thereof, and three signal stations. Fig. 2 is an enlarged detail in elevation of the step-by-step device. Fig. 3 is a view similar to Fig. 1 but showing a modified form of my invention. Fig. 4 is an enlarged diagrammatical detail of the track circuit interrupter of Fig. 3. Fig. 5 is an enlarged detail of the normally closed spring contact member in its proper position relative to the interrupter, Fig. 4.

I have shown my invention as embodied in a normal clear signaling system, although my invention is not limited to such embodiment thereof.

In the embodiment of my invention illustrated in Fig. 1, the three signal stations are designated A, B and C, respectively, and similar parts of the apparatus at the several stations are designated by similar reference numbers, the numbers being followed, wherever necessary in the following description, by letters to indicate at which station the parts in question are located. The track rails 1 and 2 are divided by insulation in the usual way into successive insulated sections, as shown, one track section for each block, and at the entrance end of each block is a home-and-distant signal apparatus, shown in this instance as two lower quadrant signals, the upper a home signal and the lower a distant signal, each signal being a two-position signal, in accordance with the usual practice where separate home and distant signals are employed. Local signal circuits are in control of the signal apparatus, and to control the local signal circuits I employ an electro-translative device which is adapted, when it receives one actuation, to close the home circuit, and when it receives a second actuation to close the home-and-distant circuit, and I therefore call the electro-translative device a "step-by-step" device. The step-by-step device comprises a track relay 3, connected across the track rails at the rear end of the block, and having a piv-

oted armature 4 (see Fig. 2) having a pawl 5 at the free end thereof, and a ratchet 6 in position to be actuated by the pawl 5, the shaft of this ratchet carrying a contact arm 7. The contact arm is an electrical conductor and is connected at its pivoted end to the track rail 1 by wire 9, and its free end is adapted in its rotation to coact successively with three contacts, 10, 11 and 12, and with two other contacts, 10^a and 10^b, concurrently with contacts 11 and 12, respectively, which contacts I designate, respectively, the track circuit contacts 10, 10^a and 10^b, the home signal contact 11, and the home-and-distant signal contact 12. The three track-circuit contacts 10, 10^a and 10^b, are connected by wire 15, and the track circuit in control of the relay 3 comprises the battery 13, wire 14, right rail 2, wire 16, coils of relay 3, wire 17, left rail 1, wire 9, arm 7, and either the contact 10, 10^a or 10^b, and wire 15 back to the battery, according to the position of the arm 7. The ratchet 6 is provided with two teeth, one for each position in which the arm 7 is held by the pawl 5.

I have lettered the three blocks, the signal stations of which are shown in Fig. 1, as *a*, *b* and *c*, respectively.

In operation, suppose a train has just entered block *a*, thereby shunting out the track relay 3^A. The relay, being deënergized, permits the armature 4 to be raised by the retractile spring 18 and thereby releases the ratchet 6. The arm 7 falls by gravity and closes the track circuit contact 10, leaving both the contacts 11 and 12 open. The home and distant signal circuits are thereby opened, and the semaphore blades are raised by gravity to danger, since they have a bias to that position. In other words, the parts all assume the position shown at station C in Fig. 1. As the armature 4 is raised, a spring 19 (see Fig. 2) swings the pawl 5 out to position such that it will engage the first tooth when again depressed, and a shoulder 20 on the armature is engaged by a lug 21 on the pawl and prevents the pawl from being swung out too far. A guide projection 22 is secured to a bracket arm on the relay 3 and is positioned so as to press the pawl firmly against the ratchet as the armature is depressed and thus prevent the ratchet from rotating by its own momentum more than one tooth when the armature is depressed. When the train passes from the block *a* to the block *b*, the wheels no longer shunt the track relay 3^A and the relay, being again energized, attracts the armature 4 and the ratchet is rotated one tooth, thereby raising the arm 7 from the contact 10 to the contacts 10^a and 11, thereby closing the home-signal circuit as follows: contact 11, wire 23, home-signal mechanism, wire 24, local battery 25, wire 26, and arm 7. The home signal is thereby moved to clear and the distant signal remains at danger. In other words, the parts assume the position shown at station B, while those at station B assume the position shown at station C. When the train passes from block *b* to block *c*, as shown in Fig. 1, the arm 7^B is rotated from the contact 10 to contact 11 and contact 10^a in the manner previously described with reference to the similar movement of arm 7^A when the tram passed from block *a* to block *b*. This movement temporarily interrupts the track circuit of the block *a*, the rapidity of the movement of the arm being timed to effect the desired result. This temporary interruption deënergizes the track relay 3^A long enough to allow it to release its armature 4^A, which is retracted by the spring 18^A and places the pawl 5^A in position to engage the next tooth on the ratchet 6^A. The ratchet 6 is designed to be comparatively slow acting, and before the arm 7^A starts to fall and open the contact 11^A the track circuit of the block *a* is again restored by the engagement of the arm 7^B with the contact 10^a and the track relay 3^A is again energized and the armature 4^A again drawn down. The pawl 5^A strikes the next tooth on the ratchet 6^A and rotates the ratchet one more step, thereby raising the arm 7^A to the contact 12 and closing the home-and-distant signal circuit as follows: contact 12, wire 27, distant-signal mechanism, home-signal mechanism, wire 24, local battery 25, wire 26, and arm 7. The home signal is therefore retained at clear and the distant signal is rotated to clear. In other words, the parts at station A assume the position shown in Fig. 1, while the parts at the other stations B and C also assume the position shown in Fig. 1 in the manner previously described with reference to station A.

The home-and-distant contact 12 is shown as segmental in order to assure a contact. Stops 28 and 29 are provided for the arm 7 and the armature 4, respectively, to limit their movement. It is evident that when the arm 7^B is moved from engagement with the contacts 10^a and 11 to the contacts 10^b and 12, the track circuit of the block *a* is temporarily interrupted, but inasmuch as but two teeth are provided on the ratchet 6, this impulse does not operate to rotate the ratchet 6^A and arm 7^A at the station in rear, whereat both signals will be retained at clear, as shown, until the track circuit of the block *a* is shunted by a train or interrupted for a sufficiently long period, as by the breakage of a rail or the failure of the battery, to permit the slow acting ratchet 6^A and arm 7^A to fall to the position shown at station C, Fig. 1.

In the modified embodiment of my invention shown in Fig. 3, the three signal stations are designated as D, E and F, respectively, and wherever necessary in the

following description, the reference numbers will be followed by letters to indicate at which station the parts in question are located. The successive blocks of which the signal stations are shown, are designated by *d*, *e* and *f*, respectively. In this embodiment of my invention I provide means independent of the clearing of the home signal ahead for giving the home-and-distant signal clearing impulse to the step-by-step device, such means comprising a track-circuit interrupter, which is actuated by the step-by-step device when the latter performs its home-signal clearing function. In case the home signal ahead is at danger, means are provided for preventing the track-circuit interrupter from operating until the home signal is cleared; but in case the home signal ahead is not put to danger as, for example, when a train takes a siding, the track-circuit interrupter is free to perform its function and give the home-and-distant signal clearing impulses to the step-by-step device immediately following the home-signal clearing operation of the step-by-step device. The step-by-step electro-translative device at the entrance end of each block in control of the local signal circuits consists of the track relay 32, having the armature 33 carrying a pawl 35, a ratchet 36 and the contact arm 37, all corresponding to the similar parts of the step-by-step devices illustrated in Fig. 1. The contact arm 37 is arranged to control the home and home-and-distant contacts 38 and 39, respectively, these contacts being shown as segmental to present an increase of range of contact. The armature 33 carries a vibratory contact member 34, the function of which will appear later. At the exit end of each block there is connected across the track rails an electro-translative device, which I term the track-circuit interrupter. This track-circuit interrupter comprises the relay 40, having an armature 41 carrying a pawl 42, a ratchet 43 arranged to be actuated by the pawl 42, a weighted arm 44, a circuit-breaking member 45 carried by the ratchet, and a normally closed spring contact member 46 in the track circuit and arranged to be controlled by the circuit-breaking member 45. The track circuit which is in control of the step-by-step translating device and the track-circuit interrupter comprises the track battery 47, wire 48, right rail, wire 49, coils of relay 32, wire 50; and either contact 51, vibratory contact member 34 and wire 52, or contact 53, arm 37, and contact 54; wire 55, left rail, wire 56, coils of relay 40 and spring contact member 46, back to the track battery 47.

In operation, suppose a train enters the block *d*; the relay 32, being shunted out of the track circuit by the wheels of the train, becomes deënergized and the retractile spring 57 raises the armature 33 up against its stop, thereby releasing the ratchet 36. The arm 37 is thereupon rotated by gravity down to its lower stop, leaving both the home and home-and-distant contacts 38 and 39 open. The signals are then raised by gravity to danger, since the semaphores have a bias to that position. In other words, the parts assume the position shown at station F. Now, assuming that the train passes from the block *d* to the block *e*, the apparatus at station E, of course, goes through precisely the operation as just described with reference to station D, while at station D, since the relay 32 is again energized by the track circuit, the step-by-step device receives the first or home-signal clearing impulse. The armature 33 is drawn down, the pawl 35 engages the first of the two teeth of the ratchet 36 and raises the arm 37 from its lower stop to engagement with the home contact 38. The home-signal circuit is thereby closed as follows: contact 38, wire 58, home-signal mechanism, wire 59, local battery 60, wire 61 and arm 37; and the home signal is thereby cleared. This movement of the armature 33 also results in giving to the track circuit interrupter at the exit end of the block its actuating impulses in the following manner: When the armature 33 first starts to be depressed and before the pawl 35 has engaged and swung the ratchet around so that the arm 37 bridges across the two sliding contacts 53 and 54 the vibratory member 34, which closed the contact 51 when the armature 33 was in its upper position, now rapidly vibrates due to its resilient character and rapidly opens and closes the track circuit at the contact 51. The vibratory member 34 is an extremely flexible elastic reed of the well-known construction. As the armature 33 is attracted, the inertia of the reed causes it to be flexed and to break its contact with the contact 51, and the resiliency of the reed causes it to vibrate for a limited length of time until it stops of its own accord. These rapid temporary interruptions of the track circuit result in the rapid releasing and attracting of the armature 41 of the relay 40 in the track-circuit interrupter and the pawl 42 therefore engages and actuates the ratchet 43. The parts are so designed that this operation will result in rotating the ratchet 43 a little more than half way around, so that, if unobstructed, the weighted arm 44 will gravitate and rotate the ratchet 43 the remainder of a complete rotation. Immediately following this operation, the arm 37 will engage the sliding contacts 53 and 54 and integrally restore the track-circuit. The armature 41 is made very quick-acting to perform its function while the armature 33 is made relatively slow-acting, so as not to

respond to the rapid temporary interruptions of the track circuit effected by the vibratory member 34.

Each home signal operates an arm 62, which is arranged to be moved into and out of the path of the weighted arm 44 by the movement of the home signal to danger and to clear, respectively. Therefore, with the train on block *e* and the home signal at station E at danger, the arm 62^E is depressed in the path of the weighted arm 44^E and the track-circuit interrupter is prevented from performing its operation until the home signal at E is cleared. This is the position of the parts shown at station F. In other words, the track circuit interrupter serves as a storing-up device while the energy is imparted to it by the home-signal clearing operation of the step-by-step device at the entrance end of the block, and is ready to give back this energy to the step-by-step device when the home signal ahead is cleared, thereby imparting to the step-by-step device its home-and-distant signal clearing function. This operation of the track-circuit interrupter will now be described. Now suppose that the train passes from the block *e* to the block *f*, as shown in Fig. 3. The track relay 32^F is deënergized, the arm 37^F falls, the signals are moved to danger, and the arm 62^F is thereby moved down into the path of the weighted arm 44^F of the track-circuit interrupter. The track-circuit interrupter at the station F is given its operative impulses by the home-signal clearing operation of the step-by-step device at station E and the arm 44^F is swung around against the arm 62^F, as previously described. At the station E, when the home signal is cleared, the arm 62 is withdrawn from the path of the weighted arm 44^E and the arm gravitates and rotates the ratchet 43 the remainder of its complete rotation. This final rotation of the ratchet 43 effects the operation of the circuit-breaking member 45^E and the circuit-breaking arm is provided with a plurality of teeth and the parts are so positioned relatively to each other that the spring contact member 46^E is in the path of the arm 45. The contact member 46 consists of two resilient contact fingers 63 and 64 (Fig. 5) normally in contact with one another, with the finger 64 extending up in the path of the teeth on the arm 45; and as the arm 45 rotates, the teeth engage the finger 64 and temporarily open and close the contact, thereby temporarily interrupting the track circuit. This temporary interruption provides the second or home-and-distant signal clearing impulse for the step-by-step device at station D. The plurality of teeth on the arm 45 assures that the track circuit will be sufficiently interrupted to effect the operation of the slow-moving armature 33. This second impulse causes the arm 37^D to be swung around to the home-and-distant contact 39 and close the home-and-distant local signal circuit as follows: contact 39, wire 65, distant signal mechanism, home signal mechanism, wire 59, local battery 60, wire 61, and arm 37.

In case a train, instead of passing from one block to another one ahead, takes a siding or backs off from the block so that the home signal ahead is not set to danger, the arm 62 is not moved down in the path of the weighted arm 44 of the track-circuit interrupter, and when the step-by-step device in clearing the home signal gives the operating impulses to the track-circuit interrupter ahead, the arm 44, being moved more than half way around, falls immediately to complete the rotation of the ratchet 43 and the interrupter arm 45 engages and opens the contact 46, with the result that the track circuit is temporarily interrupted and the step-by-step device immediately receives its home-and-distant signal clearing impulse.

It is obvious that various modifications may be made in the constructions shown and above particularly described within the principle and scope of my invention.

I claim:

1. A railway traffic-controlling system comprising a traffic-controlling apparatus located in proximity to the railway track and arranged to give a plurality of traffic-controlling indications, a step-by-step electro-translative device arranged in control of the traffic-controlling apparatus to cause the traffic-controlling apparatus to give the successive indications as the step-by-step device is operated each successive step, and a succession of controlling electric circuits each arranged in control of the step-by-step device and each arranged under the control of a railway vehicle, whereby a moving vehicle controls the successive circuits to operate the step-by-step device its successive steps.

2. A railway traffic-controlling system comprising a traffic-controlling apparatus located in proximity to the railway track and arranged to give a plurality of traffic-controlling indications, a step-by-step electro-translative device arranged in control of the traffic-controlling apparatus to cause the traffic-controlling apparatus to give the successive indications as the step-by-step device is operated each successive step, and a plurality of track circuits each including a portion of the track rails and each arranged under the control of a railway vehicle to operate the step-by-step device one step, whereby a moving vehicle successively controls the track circuits to cause the step-by-step device to be operated through its successive steps.

3. A railway traffic-controlling system

comprising a home-and-distant signaling apparatus located in proximity to the railway track, a step-by-step electro-translative device arranged when operated one step to control the home signal and when operated another step to control both the home and distant signals, and two track circuits each arranged under the control of a railway vehicle to operate the step-by-step device one step, whereby when both track circuits have been controlled by a moving vehicle the step-by-step device has been operated two steps, and both the home and distant signals are controlled.

4. A railway traffic-controlling system comprising a home and distant apparatus located in proximity to the railway track, local circuits in control of the home and distant apparatus, one for the home apparatus and the other for both a step-by-step electro-translative device arranged in control of the local circuits, and a plurality of track circuits including the track rails and each arranged under the control of a railway vehicle to operate the step-by-step device one step, the electro-translative device being adapted to receive an impulse for controlling the home traffic-controlling apparatus as a moving railway vehicle passes off one track circuit, and to receive an additional impulse for controlling the home-and-distant traffic-controlling apparatus as the vehicle passes off a track circuit in advance.

5. A railway home and distant signal system comprising a home and distant signal apparatus located in proximity to the railway track, local signal circuits in control of the signal apparatus, track circuits including the track rails, and a step-by-step electro-translative device controlled by track circuits and arranged in control of the local signal circuits, the electro-translative device being adapted to receive signal-controlling impulses from the movement of a railway vehicle over the track circuits and to be actuated by a predetermined number of impulses to control the home signal and to be actuated by a predetermined number of additional impulses to control both signals.

6. A railway home and distant signal system, comprising a home and distant apparatus located in proximity to the railway track, local signal circuits in control of the signal apparatus, a plurality of track circuits including the track rails, and a step-by-step electro-translative device controlled by a track circuit and arranged in control of the local signal circuits, the electro-translative device being adapted to receive a predetermined number of impulses for controlling the home-signal as a moving railway vehicle passes off the track circuit in control of the electro-translative device, and to receive an additional predetermined number of impulses for controlling the home-and-distant signal as the vehicle passes off a track circuit in advance.

7. A railway home and distant signal system, comprising a plurality of home and distant signal apparatus located in proximity to the railway track, local signal circuits in control of the signal apparatuses, a track circuit for each signal apparatus including the track rails, and a plurality of step-by-step electro-translative devices, one controlled by each track circuit and arranged in control of the local signal circuits, and also in control of the next preceding track circuit, the electro-translative device being adapted to receive a predetermined number of impulses for controlling the home-signal circuit as a moving railway vehicle passes off the track circuit in control of the electro-translative device, and to receive an additional predetermined number of impulses for controlling the home-and-distant signal circuit as an electro-translative device in advance in control of the track circuit receives its impulses for controlling its home-signal circuit.

8. A railway signal system comprising a home and distant signal apparatus located in proximity to the railway track, local signal circuits in control of the signal apparatus, a plurality of track circuits including the track rails, a step-by-step electro-translative device controlled by a track circuit and arranged in control of the local signal circuits, the electro-translative device being adapted to receive a home-signal clearing impulse when a moving railway vehicle passes off the track circuit in control of the translative device, and means in control of the track circuit for interrupting and restoring said track circuit when the vehicle passes off a block in advance, the electro-translative device being arranged to receive a distant-signal clearing impulse when the track circuit in control thereof is restored after being thus temporarily interrupted.

9. A railway home and distant signal system comprising a home-and-distant signal apparatus located in proximity to the railway track, local signal circuits in control of the signal apparatus, a step-by-step electro-translative device in control of the local signal circuits and arranged when given a pre-arranged number of impulses to clear the home signal and when given a pre-arranged additional number of impulses to clear the distant signal, and track circuits in control of the translative device.

10. A railway home and distant signal system comprising a railway track divided into blocks and home and distant signal apparatus for each block located in proximity to the railway track, local signal circuits in control of the signal apparatus, a step-by-step electro-translative device for each signal apparatus in control of the local signal

circuits and arranged when given a pre-arranged number of impulses to clear its home signal and when given a pre-arranged additional number of impulses to clear its distant signal, and a track circuit for each block substantially co-extensive with the block and in control of the translative device of that block and the block in the rear, the track circuits being arranged under the control of a moving railway vehicle so that the passing of a vehicle off the block causes the necessary impulses to clear the home signal, and the passing of a vehicle off a block in advance gives the necessary additional impulses to clear the distant signal.

11. A railway home and distant signal system comprising a railway track divided into blocks and home and distant signal apparatus for each block located in proximity to the railway track, local signal circuits in control of the signal apparatus, a step-by-step electro-translative device for each signal apparatus in control of the local signal circuits and arranged when given a predetermined number of impulses to clear its home signal and when given a predetermined additional number of impulses to clear its distant signal, and a track circuit for each block substantially co-extensive with the block and in control of the translative device, the track circuits being arranged under the control of a moving railway vehicle so that the passing of a vehicle off the block causes the necessary impulses to clear the home signal, each step-by-step electro-translative device being constructed to impress an additional impulse upon a track circuit in rear as it clears its home signal, whereby the distant clear impulse is given to a step-by-step electro-translative device in the rear.

12. A home and distant signal system comprising a home-and-distant signal apparatus located in proximity to the railway track, local signal circuits in control of the home and distant signal apparatus, two track circuits including the track rails, a step-by-step electro-translative device controlled by the track circuit at the signal apparatus and arranged in control of the local signal circuits and adapted to receive the home signal-clearing impulse from its track circuit when a railway vehicle passes off the track circuit, and a track-circuit interrupter in control of the other track circuit and actuated by the step-by-step translative device and adapted to interrupt and restore said other track circuit to impress the distant-signal clearing impulse upon that track circuit, and a step-by-step electro-translative device and local signal circuits and home-and-distant signal apparatus controlled by said other track circuit.

13. A home and distant signal system comprising home and distant signal apparatuses located in proximity to the railway tracks, local signal circuits in control of the home and distant signal apparatuses, a step-by-step electro-translative device for each signal apparatus in control of the local circuits, a track circuit including the track rails in control of each electro-translative device and arranged to give the home-signal clear impulse to the translative device when a railway vehicle passes off the track circuit, and a track-circuit interrupter in control of the preceding track circuit and actuated by the step-by-step translative device and controlled by the home signal and adapted to interrupt and restore the preceding track circuit to give the distant-signal clearing impulse to the step-by-step device of the preceding track circuit.

14. A home and distant signal system comprising home and distant signal apparatuses located in proximity to the railway tracks, local signal circuits in control of the home and distant signal apparatuses, a step-by-step electro-translative device for each signal apparatus in control of the local circuits, a track circuit including the track rails in control of each electro-translative device and arranged to give the home-signal clear impulse to the translative device when a railway vehicle passes off the track circuit, a second electro-translative device in the track circuit collocated with and under the control of the step-by-step electro-translative device of the signal apparatus in advance, and an interrupter for the track circuit actuated by the second electro-translative device and controlled in its movement by the home signal in advance and adapted to interrupt and restore the track circuit to give the distant-signal clearing impulse to the step-by-step device thereof.

In testimony whereof I have affixed my signature in presence of two witnesses.

CLYDE J. COLEMAN.

Witnesses:
VICTOR D. BORST,
WM. ASHLEY KELLY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."