

No. 866,261.

PATENTED SEPT. 17, 1907.

G. W. COLEMAN.
RAILWAY TRAFFIC CONTROLLING SYSTEM.

APPLICATION FILED JAN. 10, 1907.

4 SHEETS—SHEET 1.

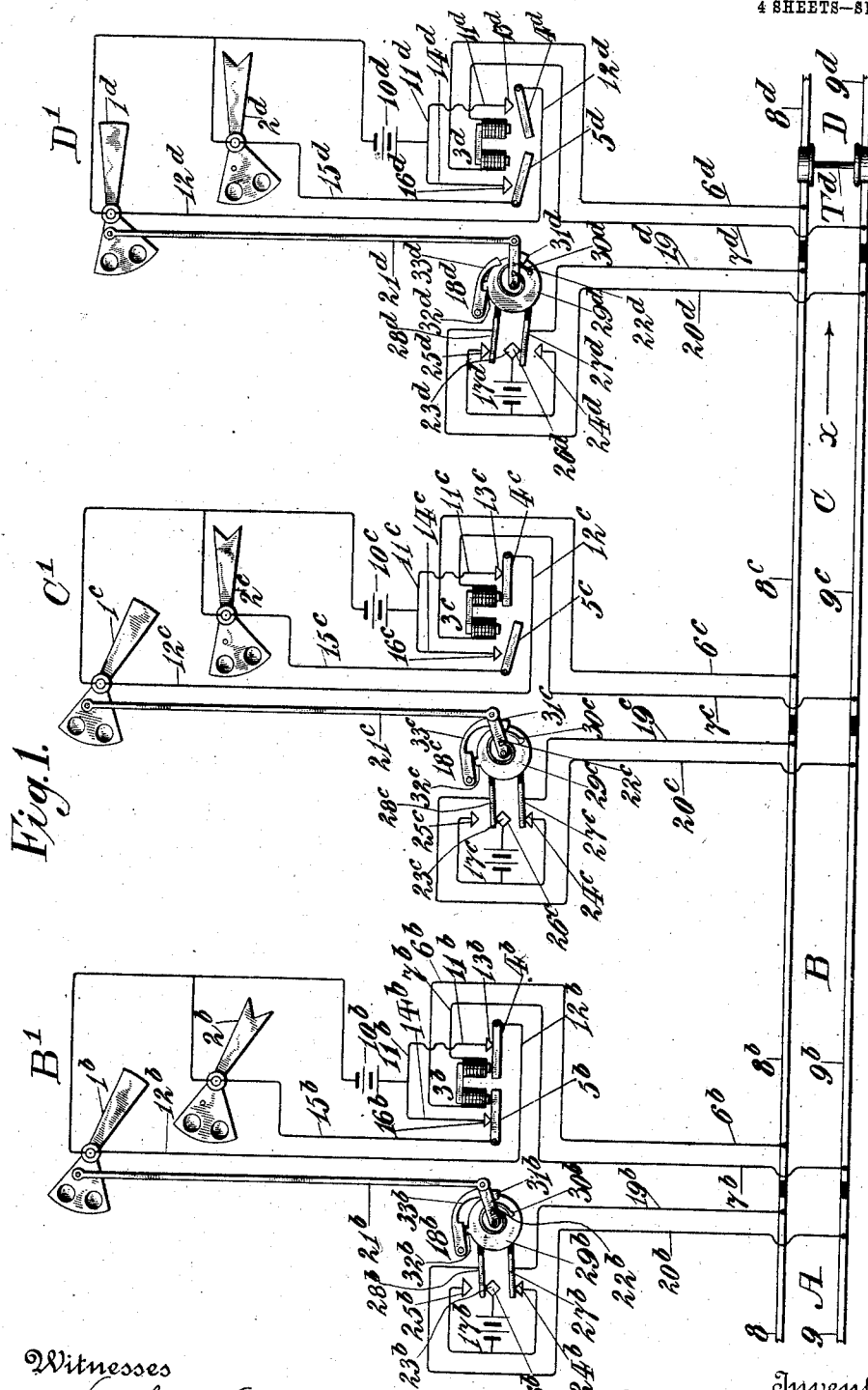


Fig. 1.

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By his Attorney
Henry B. Williams

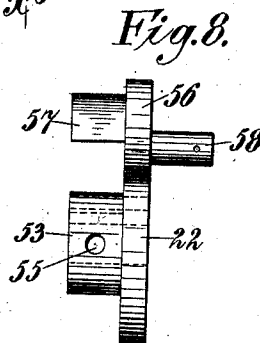
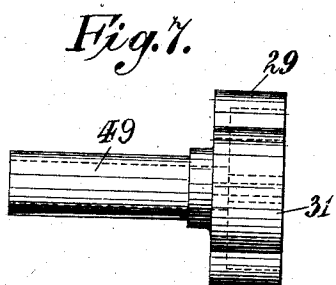
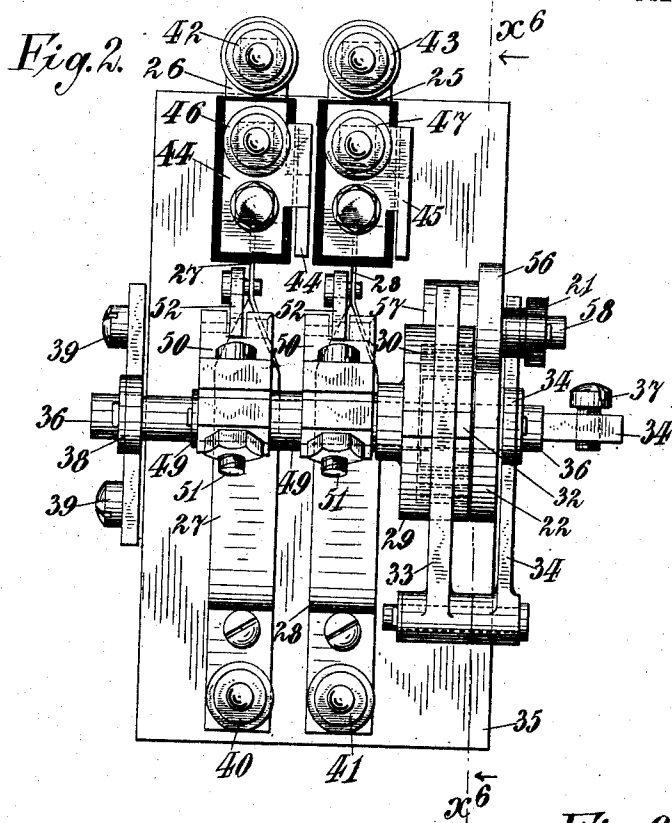
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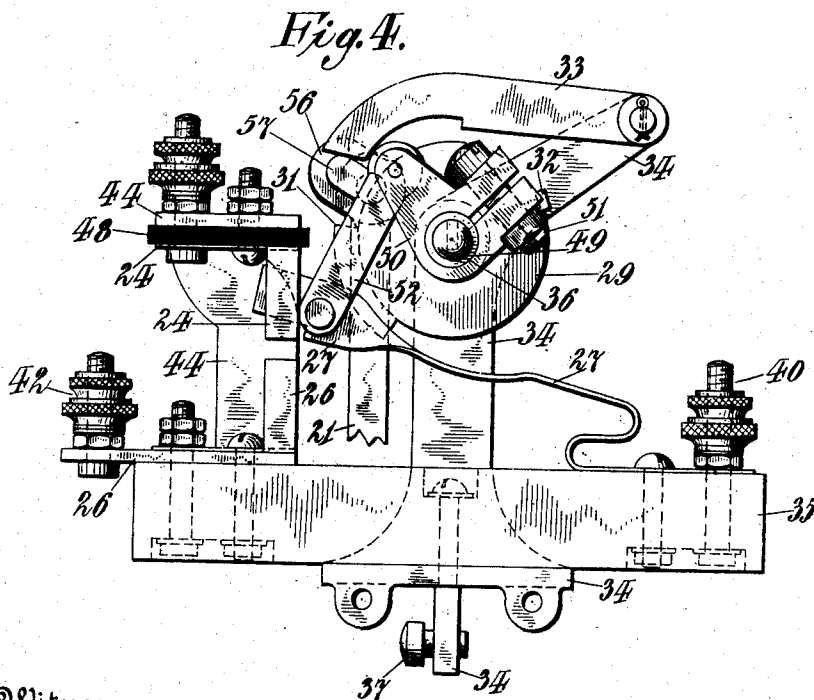
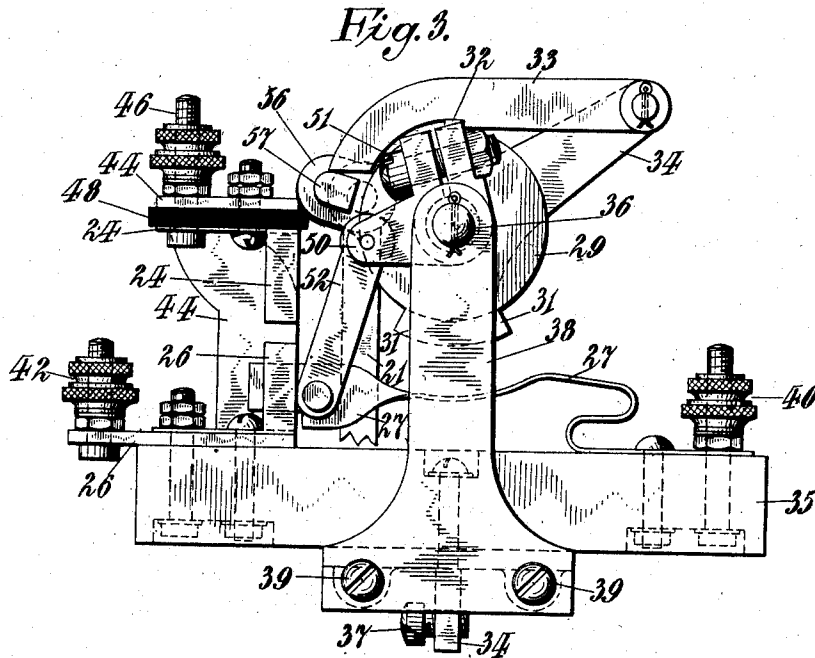
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4 SHEETS—SHEET 3.



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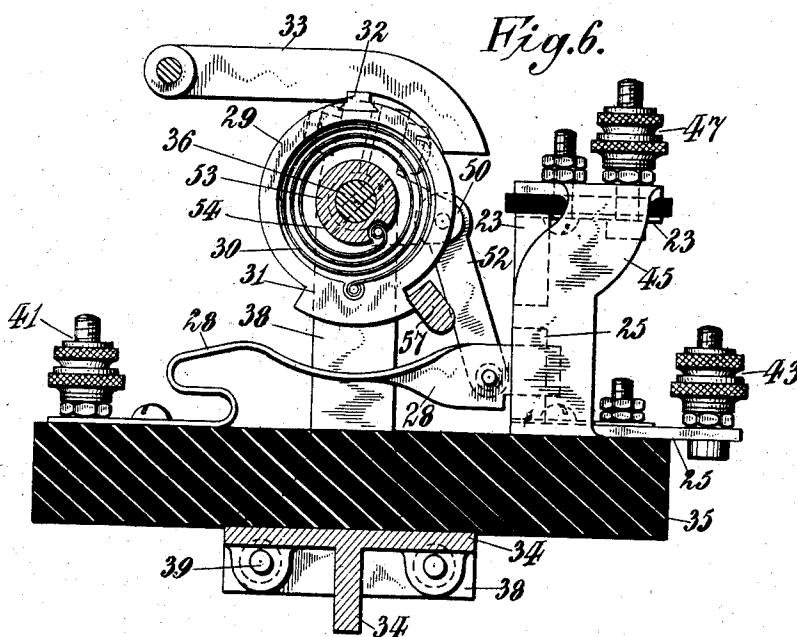
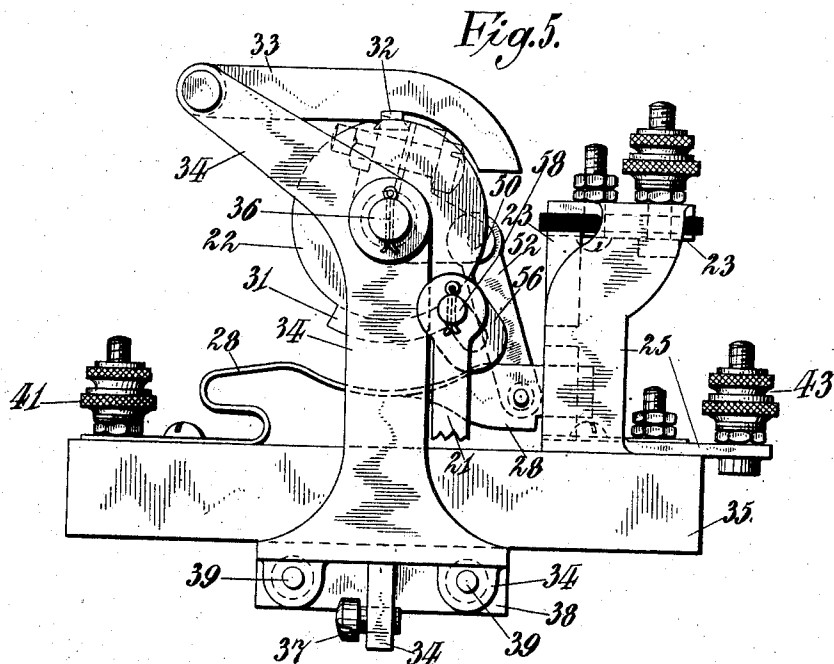
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UNITED STATES PATENT OFFICE.

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RAILWAY TRAFFIC-CONTROLLING SYSTEM.

No. 866,261.

Specification of Letters Patent.

Patented Sept. 17, 1907.

Application filed January 10, 1907. Serial No 351,616.

To all whom it may concern:

Be it known that I, CLARENCE W. COLEMAN, a citizen of the United States, residing at Westfield, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Railway Traffic-Controlling Systems, of which the following is a specification, reference being had therein to the accompanying drawings, forming a part thereof.

My invention relates to signaling systems and apparatus for controlling traffic upon railways.

In one system of standard practice a distant signal is controlled by a home signal belonging to the next block in advance. One way in common use of effecting such control is by having a signal-controlling circuit common to both the home and distant signals, the home signal being responsive to currents of either direction in the circuit and the distant signal being responsive to currents of one direction only in the circuit, the current being reversed in direction by a pole-changer actuated in conjunction with the actuation of the home signal, the home signal being directly controlled by the presence or absence of a railway vehicle in the block to which it belongs. In such a system a defect of operation which presents itself is that during the time of stoppage of the current as it is being reversed in the circuit, the home signal, owing to such stoppage in the current, will have a tendency to change its indication and thus give a wrong indication. For example, in a normal clear system, when the current is reversed to clear the distant signal, the home signal having already been cleared, the home signal might go to the danger position just ahead of an approaching train, when it should show clear. The way heretofore adopted to overcome this difficulty has been the employment of slow-acting clutch-magnets or slow-acting relays in connection with the home signal apparatus, such a magnet sustaining a circuit long enough to prevent the home signal from changing its indication during the stoppage of current above mentioned. However, it is not safe to have such a slow-acting magnet adapted to hold for more than one second, for the reason that such a magnet cannot be made sufficiently delicate and would be liable to hold for too long. Also the more slow-acting a magnet is the more expensive it is, making it desirable to use a less slow-acting magnet.

One of the objects of my invention is to effectively overcome, in an economical manner, the difficulty above mentioned.

My invention also has other objects and advantages which will appear from the following description.

My invention includes improved means to effect a quick reversal of current for the purpose of causing a magnet to again quickly pick up its armature before a semaphore has time to change its indication.

My invention also includes various details of construction hereinafter particularly described.

In the embodiment of my invention shown in the accompanying drawings, home and distant semaphores are located at the rear end of each block of a railway line, the rails of the railway track are included in the line circuit and form the conductors along the railway line, the home semaphores are actuated by currents of either direction in the line circuit and the distant semaphores are actuated by currents of one direction only in such circuit, the signal-actuating circuit or line circuit is controlled by a pole-changer or circuit controller located at the front end of each block, the pole-changer being actuated by a spring, and the spring being put under tension by or simultaneously and in conjunction with the actuation of the home semaphore located at the rear end of the next block ahead.

I will now particularly describe the system and apparatus embodying my invention which are shown in the accompanying drawings, and will thereafter point out my invention in claims.

Figure 1 is a diagram showing a system in which normal clear signals are located at the rear end of each block. Fig. 2 is a plan view of the pole-changer or reversing switch of the signaling apparatus. Fig. 3 is an elevation viewed from the left of Fig. 2 and with the parts in the same phase of operation. Fig. 4 is a similar view with the front end bearing removed, and the parts in a different phase. Fig. 5 is an elevation viewed from the right of Fig. 2 and showing yet another phase of operation. Fig. 6 is a sectional elevation taken on the line x^6-x^6 of Fig. 2 viewed from the right, and shows particularly the spring carrier, the spring, and the boss and lug of the rocking disk, the parts being in the same phase as in Fig. 5. Fig. 7 is a detail view of the spring carrier. Fig. 8 is a detail view of the rocking disk.

The construction and operation of the embodiment of my invention illustrated will now be described in detail.

The diagram Fig. 1 represents three successive home- and-distant signaling apparatuses, B', C' and D', located substantially at the termini and demarcating successive signaling blocks or sections A, B, C and D of a railway line. In the block D and in advance of the signal D', I represent a train T^d, the direction of traffic being from left to right, as indicated by the arrow x . The track rails of the respective signaling blocks are insulated from each other, as indicated. In the system shown, and in which the present invention is incorporated, the track rails constitute the only electric conductors between the successive signaling apparatuses, such a system being known as a "wireless" system, but it is to be understood that my invention could be

embodied in systems not thus characterized, and also in systems differentiated in other respects from that shown.

As the various signaling apparatuses are all identical, a description of one will suffice for all. At the apparatus B', 1^b and 2^b are respectively the home and distant signal semaphores. As there is no train in the block B, the home signal 1^b shows the clear indication, and as there is also no train in the block C, the distant signal 2^b also shows the clear indication. Each signaling apparatus includes a semi-polarized relay, that is, a relay having two armatures, one of which is polarized and one of which is non-polarized. Such a relay for the apparatus at B' is represented at 3^b, and has a non-polarized armature 4^b and a polarized armature 5^b. The terminals of the relay 3^b are connected by wires 6^b and 7^b respectively with the rails 8^b and 9^b of the block B. When the current flows in one direction through the coils of the relay 3^b it will attract and hold up both of its armatures, and when the current flows in the opposite direction it will hold up only the non-polarized armature 4^b. The home and distant signals 1^b and 2^b are held clear through having their actuating and-retaining electro-mechanisms responsive to currents from the battery 10^b, the connections to the battery being established for the home-signal through wires 11^b and 12^b leading respectively to the contact stop 13^b and to the movable contact arm or non-polarized armature 4^b, and connections to the battery being established for the distant-signal through wires 14^b and 15^b leading respectively to the contact stop 16^b and to the movable contact arm shown as constituting the polarized armature 5^b. The evident results are that both the home and distant signals will be cleared and held clear when a current of a certain direction through the coils of the relay 3^b causes both of the armature contact arms to be held up against their respective contact stops; that both signals, as they have a normal bias to danger, will stand at danger when no current flows through the relay coils; and that only the home signal will be cleared and held clear when the current through the relay coils is in the opposite direction to that required for clearing both signals. The relay 3^b receives its energizing current from a track battery 17^a, located at the forward end of block B, and connected through a circuit-controller or pole-changer 18^a, by wires 19^a and 20^a, respectively, to rails 8^b and 9^b. The track battery 17^a and pole-changer 18^a are located at the forward end of block B, and form, by virtue of their location, a part of the signaling apparatus C', though virtually and operatively belonging to block B and having to do with the traffic control of the block B, and having nothing to do with the traffic control of the block C. The pole-changer 18^a is operatively controlled in conjunction with the operation of the home signal 1^a, and, for the sake of simplicity in the diagram, is shown as operated thereby through a connecting rod 21^a connected to the rocking arm 22^a of the pole-changer 18^a. The pole-changer or circuit controller is shown in Fig. 1 merely in diagrammatic outline, and a certain specific construction thereof, to be described presently, is illustrated in the other figures of the drawings, but first the principle of operation of this circuit controller will be described by reference to Fig. 1. The battery 17^a is shown as having its opposite poles connected by wires respectively to lower

contact stops 23^a and 24^a and to upper contact stops 25^a and 26^a. Switch blades or movable contact terminals 27^a and 28^a are adapted to engage respectively with either the lower or upper contact stops and are respectively electrically connected to the respective track rails 8^b and 9^b of the block B by the wires 19^a and 20^a. In the diagram the contact fingers 27^a and 28^a are shown as rigidly attached to a pivoted spring carrier 29^a, but insulated therefrom. The rocking arm 22^a has a common pivot with the spring carrier and is operatively connected therewith through the medium of a coiled spring 30^a anchored at its opposite ends to the rocking arm and to the spring carrier respectively. The spring carrier has a lug 31^a in the path of the rocking arm, so that the spring carrier is actuated positively by the rocking arm in one direction of its movement. The spring carrier also has a lug 32^a adapted to be engaged by a pawl 33^a when the spring carrier has been rocked in a clockwise direction, as viewed in Fig. 1, by the rocking arm engaging with the lug 31^a. This corresponds with the danger position of the home signal. These positions of the parts may be seen at D', as all of the pole-changing circuit controllers in the system are of the same construction.

The engagement of the pawl with the corresponding lug of the rocking arm locks the contact fingers in contact with the upper contact stops of the track battery, as represented in the diagram. The free end of the pawl lies in the path of the rocking arm at a point near to the limit of its upward movement, so that as the rocking arm moves in a counter-clockwise direction, the spring is first put under tension, without any movement of the spring carrier and contact fingers taking place, and then, just before the limit of movement of the rocking arm is reached, the free end of the pawl or detent is engaged thereby and the pawl lifted out of engagement with the coacting lug, thereby causing the spring carrier to be turned in a counter-clockwise direction by the spring and to move the contact fingers so as to break the battery circuit at the upper contact stops and to make a circuit through the lower contact stops, thus reversing the polarity of the battery in reference to the wires leading to the track rails. These phases of the parts, corresponding to the clear position of the home signal, may be seen at B' and C'. It thus becomes evident from the above that the pole-changing circuit controller is actuated positively in one direction in conjunction with the movement to danger position of the collocated home signal semaphore, and that it is actuated in the opposite direction in conjunction with the movement to clear position of the collocated home signal semaphore, the coiled spring first being put under tension and then released to effect the last named actuation.

The specific construction of the circuit controller shown as employed will now be described, after which the complete operation of the system will be given. Reference will be had to Figs. 2 to 8 inclusive, and also to Fig. 1, the mechanisms collocated at C' being referred to as examples of all. An L-shaped bracket 34 supports a base 35, of insulating material, and also provides a bearing for one end of a shaft 36 and is provided with means for attachment to the signal apparatus, as, for example, screws, one of which appears at 37. The other end of the shaft 36 has a bearing in a bracket 38,

shown as attached to the bracket 34 by screws 39. The insulating base 35 supports two spring switch-blades or movable contact terminals 27 and 28, corresponding to the movable contact terminals 27^a and 28^a shown in the diagram of Fig. 1, and are provided with binding posts 40 and 41 to which we may consider that the two wires 19^a and 20^a, for example, are respectively connected. The base 35 also supports two pairs of lower jaws or stationary contact terminals 26 and 25 corresponding to the upper stationary contact stops 26^a and 25^a of the diagram, and are provided with binding posts 42 and 43, for the wires leading respectively to the positive and negative poles of the track battery, such as 17^a. The base 35 carries also brackets 44 and 45, which support upper jaws or stationary contact terminals 24 and 23, respectively, corresponding with the lower contact stops 24^a and 23^a at C', and are provided with binding posts 46 and 47, for the wires leading respectively to the negative and positive poles of the track battery, as 17^a.

The upper jaws 23 and 24 are insulated from their supporting bracket 44 by insulating plates 48. It is apparent from the above that the upper stationary jaws are respectively connected to wires of opposite polarity from the corresponding lower stationary jaws, it being also apparent that this will result in reversing the battery current through the switch-blades and the wires connected thereto when the switch-blades are moved from engagement with one set of the stationary contact jaws to engagement with the other set.

A spring carrier or case 29 is loosely rotatably mounted upon the shaft 36 and has two diametrically opposite lugs 31 and 32 and also has a sleeve 49 extending along the shaft 36. Switch-blade-actuating crank-arms 50 are fixed upon the sleeve 49, as by clamping bolts 51, and are respectively connected by insulating links 52, with the switch blades 27 and 28. When the spring carrier is rocked the switch-blades will be moved from engagement with one set of stationary contact jaws into engagement with the other set.

A rocking disk 22, having a boss or hub 53, is shown as fixed upon the shaft by a pin 54 passing through the shaft and through the boss 53 at the hole 55. The rocking disk 22 has a radial arm 56, and the arm 56 has a laterally projecting lug 57 on the side next to the boss 53, and the radial arm has on the side opposite to the lug a crank-pin 58. A connecting rod 21 is pivoted upon the crank-pin 58, and the power for actuating the rocking disk is supplied through this connecting rod in conjunction with a movement of the home signal.

The boss 53 of the rocking disk 22 extends within the cup-shaped spring carrier 29, and the radial lug 31 of the spring carrier lies in the path of the lateral lug 57 of the rocking disk. A switch-blade-actuating coiled spring 30 is located within the spring carrier and is anchored thereto and to the hub 53 of the rocking disk, the direction in which the spring is coiled being such that, if the spring carrier be stationary, the spring will be put under tension or wound by a counter-clockwise rotation of the rocking disk when viewed from the crank pin side thereof. Such counter-clockwise movement will be produced by an upward movement of the connecting rod 21. While the spring is being put under tension the spring carrier is prevented from rotating by a pawl 33 pivoted on an extension of the bearing bracket 34 and engaging the lug 32 of the

spring carrier. The free end of the pawl 33 is curved downward and lies in the upward path of the lug 57 of the rocking disk at a point nearly at the limit of movement of the rocking disk, so that as the connecting rod 21 moves upward the spring is first wound by the rotation of the rocking disk and then, just before the connecting rod has reached the limit of its movement, the lug 57 will strike the end of the pawl 33 and lift the pawl clear of the lug 32 on the spring carrier, thus permitting the spring to rotate the spring carrier. When the spring carrier is thus rotated by the spring the switch blades 27 and 28 will be moved out of engagement with the lower set of stationary contact jaws and into engagement with the upper set of stationary contact jaws, with the effect, as already described, of reversing the polarity of the track battery, such as 17^a, with relation to the track rails 8^b and 9^b and therefore with relation to the semi-polarized relay 3^b, controlling the home and distant signals at B'. The upward position of the connecting rod 21 corresponds to the clear position of the home signal. As shown, the arrangement is such that when the connecting rod is up, as may be seen at C', the semi-polarized signal-controlling relay attracts both of its armatures, as seen at B'. It has hereinbefore been pointed out that when both of the armatures of one of the signal-controlling relays are attracted that the collocated home and distant signals will be held at the clear positions, indicating at least two blocks clear.

When a home signal goes to the danger position, the connecting rod 21 will be moved downwardly in conjunction therewith, rotating the rocking disk in the opposite direction, and causing the lug 57 of the rocking disk to engage with the lug 31 of the spring carrier, thereby directly rotating the spring carrier which in turn will move the switch blades 27 and 28 out of engagement with the upper set of stationary contact jaws and into engagement with the lower set of stationary contact jaws, thus supplying current to the semi-polarized signal-controlling relay, located with the signaling apparatus at the block next in rear, in a direction such as to influence the relay to attract only its non-polarized armature. As previously pointed out, when only the non-polarized armature of a signal-controlling relay is attracted, only the collocated home signal will be held at the clear position, while the collocated distant signal will remain at danger, thus indicating only one block clear, as may be seen at C'. Taking the pole-changing circuit controller diagrammatically shown at C' as an example of the others, it should be stated that the diagrammatic parts as numbered correspond in identity and function to the parts indicated by like numerals without the affixed letter *c* in the other figures of the drawings.

Having reference now to the operation of the complete system, as shown, it will be noted that the presence of the train T^d in the block D forms a shunt circuit of low resistance bridging the rails 8^d and 9^d and that the signal-controlling relay 3^d, located at D', is for that reason deenergized. When the relay 3^d is deenergized the collocated home and distant signals 1^d and 2^d will stand at danger, for reasons already explained, near the beginning of this description. When the train T^d passed from block B into block C, the home and distant signals at C' both went from the

clear position to the danger position, in the same manner as just explained in reference to the signals at D', the signal-controlling relay 3^c being short circuited and deenergized, releasing both of its armatures. When the rear end of the train has passed from block C into block D, the electric circuit is reestablished through the coils of the relay 3^c, as they will then receive current from the battery 17^d, but the current will pass through the coils in an opposite direction to what it did when the home signal 1^d was at clear, because when the home signal 1^d went to danger it actuated the circuit controller 18^d to reverse the polarity of the connections of the battery 17^d. As already explained, when the circuit controller is actuated in conjunction with the collocated home signal going to danger, the downward movement of the connecting rod 21 causes the lug 57 of the rocking disk 22 to engage with the lug 31 of the spring carrier 29 to positively rock the spring carrier and consequently to positively move the switch blades 27 and 28. When the home signal 1^d stands at danger, current will flow through the coils of the relay 3^c in a direction that will cause them to pick up the non-polarized armature contact 4^c without picking up the polarized armature contact 5^c. As the polarized armature contact 5^c controls the distant signal, it is evident that this signal will remain at danger. As the non-polarized armature contact 4^c controls the home signal, it is evident that the home-signal semaphore-actuating-and-retaining electro-mechanism will be actuated to clear the home signal 1^c. When the train T^d passes out of the block D into the block ahead, the home signal 1^d will be cleared in the same manner. As previously explained, when a home signal is cleared, the rod 21 connected to the collocated circuit controller is moved upwards in conjunction with the movement to clear of the home signal, and the spring 30 is first put under tension and then released, the spring then moving the switch blades 27 and 28 to their opposite positions, and as may be seen in Fig. 4 and at B' and C' in Fig. 1. When the circuit controller 18^d is actuated in this manner, the polarity of the battery 17^d relatively to the terminals of the relay 3^c will be reversed. When the oppositely directional current has been established through the coils of the relay 3^c, it will then pick up its polarized armature 5^c, and the distant signal 2^c will be cleared, as may be seen in the case of the distant signal 2^b at B'. It is evident that there will be a momentary cessation of current through the coils of the relay 3^c during the time that the current is being reversed. During this time the non-polarized armature contact 4^c will not be attracted and will open the circuit of the home-signal semaphore-actuating-and-retaining electro-mechanism at the contact terminal 13^c, and it is also evident that the armature 4^c will be picked up again and close this circuit as soon as the current in the opposite direction has been established. Should the circuit controlled by the armature 4^c remain open for any appreciable length of time, it is evident that the home signal 1^c would go to danger, when it should be held at clear. Therefore, it becomes necessary that the relay 1^c should again pick up its armature 4^c before the home signal 1^c has time to change its indication.

If the pole changing circuit controller at the block in advance were actuated directly by the connecting

rod 21 in conjunction with the movement of the collocated home-signal from danger to clear, the actuation would be too slow to enable the signal controlling relay at the block in rear to pick up its non-polarized armature sufficiently quickly to accomplish the desired result, the home-signal being actuated comparatively slowly by its actuating electro-mechanism. Therefore, I provide means adapted to act upon the pole-changer, in conjunction with the movement of the home-signal from danger to clear, to move such pole-changer much more quickly than it could be moved by the connecting rod 21 directly. I have shown such means in the spring 30. Therefore, by virtue of this spring, the circuit controller or pole-changer may be designated a snap-pole-changer. Therefore, as the home-signal 1^d is moved from the danger to the clear position, the connecting rod 21^d will move the rocking arm 22^c upward, and as the spring carrier 29^d is prevented from rotating by the pawl 33^d being engaged with the lug 32^d, the spring 30 will be put under tension, and as the arm 22^c continues to move upward it will strike the free end of the pawl 33^d, which lies in its path, and in its further movement will raise the pawl free from the lug 32^d and permit the spring to rock the spring carrier 29^d, thereby moving the switch blades or contact fingers 27^d and 28^d to their other position, as may be seen in the case of the apparatus located at C'. On account of the slight friction of the rockable spring carrier and the sudden release of the spring carrier by the pawl, the snap-pole-changing action takes place very quickly. It is thus seen from the foregoing that the circuit controllers shown diagrammatically in Fig. 1 embody the same principles and operate in the same manner as the circuit controller illustrated in detail in the other figures of the drawings and in fact are to be considered as diagrammatic representations of a construction identical therewith.

It should be noted that the spring is not released until the collocated home signal has almost reached its clear position. This insures that the distant signal does not change its indication from danger to clear until the home signal by which it is controlled has substantially completed its change of indication from danger to clear.

No snap action of the circuit controller is necessary in the opposite direction of its movement, for the reason that at the time when any home signal is left free to go to danger by a train entering the corresponding block from the block in rear, both signals at the block in rear are already at danger and therefore would not be affected by open circuits, the effect being that the home signal at the block in rear would be thereby delayed in being brought to clear. As a signal goes to danger more quickly than it is brought to clear, such normal speed of movement to danger of the home signal answers all practical purposes for clearing the home signal at the block next in rear.

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

I claim:—

1. In a railway traffic controlling system, the combination of a stationary contact terminal, a movable contact terminal, an oscillatable part for actuating the movable

terminal, a spring connected to said part, a pawl for holding said part from rotating while the spring is being put under tension, a rocking arm for putting the spring under tension and then tripping the pawl, traffic-controlling apparatus, and means for concurrently actuating the

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2. In a railway traffic controlling system, the combination of a traffic controlling apparatus, a rocking arm actuated concurrently with the actuation of such apparatus, a spring-carrier, a pivot in common for the rocking-arm and for the spring-carrier, a spring anchored to the spring-carrier and to the rocking-arm, the rocking-arm being engageable with the spring-carrier to rock the spring-carrier in one direction of movement, the spring-carrier being adapted to be rocked in the opposite direction by the spring, a pawl engageable with the spring-carrier to hold the spring-carrier from rotating while the spring is being put under tension, the rocking-arm being adapted as it is rocked in the opposite direction to first put the spring under tension and then to engage with and trip the pawl to release the spring, a stationary contact-terminal, and a movable contact-terminal cooperating therewith and actuatable by the spring carrier.

3. In a railway traffic controlling system, the combination of a traffic controlling apparatus, a rocking arm actuated concurrently with the actuation of such apparatus, a spring-carrier, a pivot in common for the rocking-arm and for the spring-carrier, a spring anchored to the spring-carrier and to the rocking-arm, the rocking-arm being engageable with the spring-carrier to rock the spring-carrier in one direction of movement, the spring-carrier being adapted to be rocked in the opposite direction by the spring, a pawl engageable with the spring-carrier to hold the spring-carrier from rotating while the spring is being put under tension, the rocking-arm being adapted as it is rocked in the opposite direction to first put the spring under tension and then to engage with and trip the pawl to release the spring, two stationary contact-terminals, and a movable contact-terminal alternately engageable with the respective stationary contact-terminals, such movable contact terminal being actuatable by the spring-carrier.

4. In a railway traffic controlling system, the combination of a fixed contact-terminal, a second fixed contact-terminal, a movable contact-terminal engageable alter-

nately with each of the two fixed contact-terminals, an oscillatable part for actuating the movable contact-terminal, a spring connected to said part for moving said part in one direction, a pawl for holding said part from rotating while the spring is being put under tension, a rocking-arm movable in one direction to first put the spring under tension and then trip the pawl to permit the spring to move the movable contact-terminal out of engagement with one of the fixed contact-terminals and into engagement with the other fixed contact terminal, and movable in the opposite direction to restore said part and the movable contact terminal to their original positions, a traffic controlling apparatus, and a connecting-rod for actuating the rocking-arm and actuated in conjunction with the actuation of the traffic controlling apparatus.

5. In a railway traffic controlling system, the combination of a traffic controlling apparatus, a connecting-rod actuated in conjunction with the actuation of such apparatus, a rocking-disk actuated by the connecting-rod, a shaft upon which the rocking-disk is fixed, a spring-carrier loosely mounted upon the shaft and having a sleeve extending along the shaft, a spring anchored to the spring-carrier and also anchored to the rocking-disk, the rocking-disk being engageable with the spring-carrier to rock the spring-carrier in one direction of movement, the spring-carrier being adapted to be rocked in the opposite direction by the spring, a pawl engageable with the spring-carrier to hold the spring-carrier from rotating while the spring is being put under tension, the rocking disk as it is moved in the opposite direction being adapted to first put the spring under tension and then to engage with and trip the pawl to release the spring, a crank-arm fixed upon the sleeve of the spring-carrier, a movable contact terminal, a link connecting the crank-arm and the movable contact-terminal, and two stationary contact-terminals with which the movable contact-terminal is respectively alternately engageable.

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

CLARENCE W. COLEMAN.

Witnesses:

HENRY D. WILLIAMS,
WM. ASHLEY KELLY.