G. S. PFLASTERER.

BLOCK SIGNAL SYSTEM.

APPLICATION FILED FEB. 23, 1909.

979,556.

Patented Dec. 27, 1910.

2 SHEETS—SHEET 1.

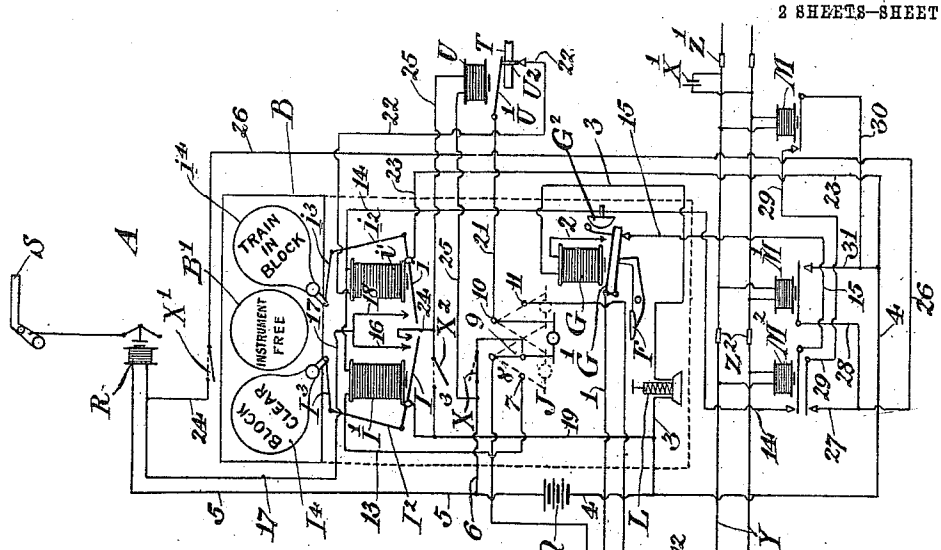

Fig. 2.

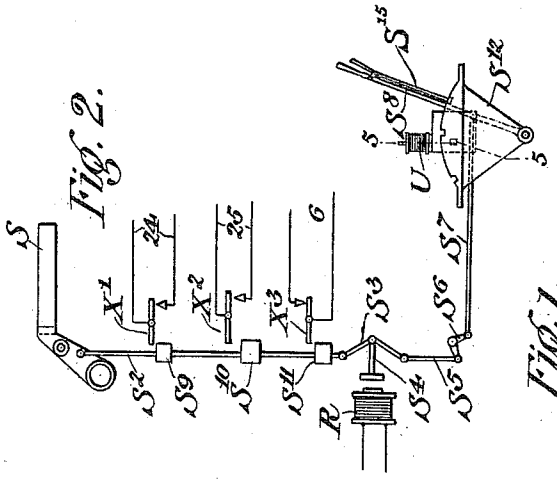

Fig. 1.

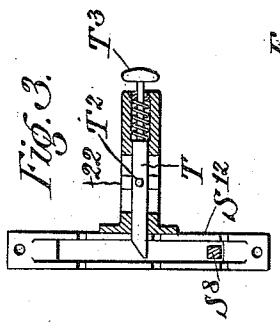

Fig. 3.

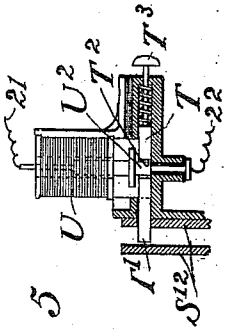

Fig. 5

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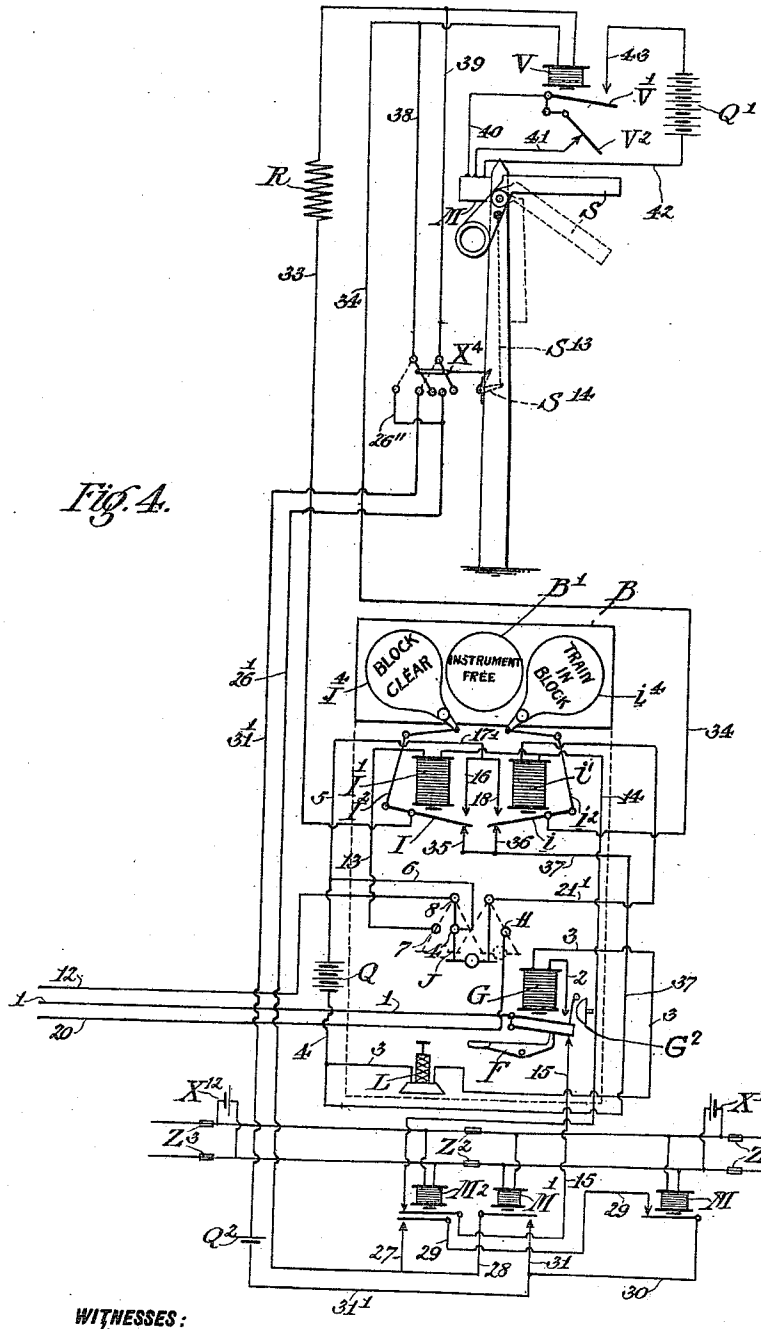
2 SHEETS—SHEET 2.

Fig. 4.



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BLOCK-SIGNAL SYSTEM.

979,556. Specification of Letters Patent. Patented Dec. 27, 1910.

Application filed February 23, 1909. Serial No. 479,612.

To all whom it may concern:

Be it known that I, GEORGE S. PFLASTERER, a citizen of the United States of America, residing in Nashville, in the county of Davidson and State of Tennessee, have invented a certain new and useful Improvement in Block-Signal Systems, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

The present invention relates to railway signals and particularly to block signal systems for single track railways, has for its main object the provision of an improved block signal system for single track railways which can be cheaply installed and is inexpensive to maintain and is reliable, effective, and relatively simple in construction and operation.

The system disclosed herein is primarily intended as an improvement on, and is of the same general type as, the system disclosed and claimed in my copending application Serial No. 437,542, filed June 9th, 1908.

The present application, like the prior application, discloses a system in which an absolute clear signal indication can be given a train about to enter a block only when the block is entirely free from trains, while a permissive signal indication may be given to admit a train to the block, following a previously admitted train still in the block, when the latter has proceeded a predetermined distance from the end of the block at which it entered.

In the signal apparatus shown in detail in said prior application, the signals are manually actuated and are controlled through electric circuit connections including slot windings and track relays. In one form of the system disclosed herein, manually actuated slot controlled signals are employed, while in another form the signal is directly actuated through an electrical operating mechanism, but the instrumentalities employed in both forms of the system disclosed in the present application for controlling the energization of the slots, or of the electrical signal actuating mechanism, are like those described and claimed in the prior application.

The system disclosed herein, like the system of the former application, resembles the well known telegraph block signal system and is particularly adapted to facilitate the conversion into the new system of existing telephone or telegraph block systems.

In my prior application, the means shown for preventing the setting of a signal in a full clear position when a permissive but not a full clear indication is proper, comprises means for opening the signal controlled slot circuit upon a movement of the signal actuating lever beyond the intermediate or cautionary position. In the form of system disclosed herein, in which slot controlled manually actuated signals are employed, however, I do away with the means for breaking the slot circuit upon a movement of the signal actuating lever beyond the intermediate position and provide in lieu thereof a mechanical latch which normally prevents the movement of the signal lever beyond the intermediate position, and I provide also an electric locking device, normally locking the latch in the latching position, and means for automatically releasing the device to permit the latch to be unlatched when a full clear signal indication is proper.

In both forms of the system disclosed herein, I provide means for maintaining the energization of the signal controlling winding when it has once been initially energized until the rear end of a train entering the block at the end where the signal controlled by the winding is located, has passed through the first section of the block, which is preferably a short section. The arrangements are such, however, that in case a following train enters the block section vacated by the entering train as the latter passes into the block the signal will be at once restored to danger, so that the signal will be set in front of the following train, no matter how closely its front end may follow the rear end of the preceding train to the signal point.

In the claims annexed to and forming a part of this specification, I have aimed to point out with particularity the features of novelty characterizing the present invention, but for a better understanding of the invention, reference should be had to the accompanying descriptive matter and drawings, in which I have described and illustrated diagrammatically, apparatus and circuit arrangements by which the invention may be carried out.

Of the drawings: Figure 1 is a diagrammatic view illustrating a portion of a signal block with that form of my system in

which manually actuated slot controlled signals are employed, the view showing the instruments located at one end of the block and certain of the intermediate connections; Fig. 2 is a diagrammatic representation of the signal proper employed in Fig. 1 and its actuating mechanism; Fig. 3 is a plan view partly in section of the signal actuating lever and locking mechanism therefor of Figs. 1 and 2; Fig. 4 is a view generally similar to Fig. 1, illustrating a modification in which the signals are electrically actuated; and Fig. 5 is a section on the line 5—5 of Fig. 2.

In the drawings, and referring first to the form of system shown in Figs. 1, 2 and 3, Y represents the track rails divided into sections by insulated joints Z', Z^2, Z^3, Z^4, etc. The signal S for the one signal station A shown is located adjacent the insulated joints Z^2 and controls the entrance of trains into the block beginning at the joints Z^2 and running to the left. For each block section shown, there is a source of current as a battery X^{11}, X^{12}, X^{13}, X^{14}, and for each of the sections shown there is a corresponding track relay M', M^2, M^3 and M^4, and in addition, there is an extra track relay M for the section adjacent the right hand end of the block to which signal S pertains.

The signal S is manually actuated, but is controlled by an electric slot. In the arrangement shown diagrammatically in Fig. 2, the actuating device is a lever S^8 which may be moved from the normal danger position shown into an intermediate position or cautionary position, or into a third or full clear position under certain conditions. The lever S^8 is connected by a rod S^7 to one arm of a bell-crank lever S^6, the other arm of which is connected by a rod S^5 to the slot links S^3, the latter being connected in turn to the rod S^2 by which the signal proper is operated. The slot links S^3 are connected to the armature S^4, which renders the slot link connection between the rods S^2 and S^5 operative when the slot winding R is energized.

The rod S^2 carries collars S^9, S^{10} and S^{11} which control switches X', X^2 and X^3. Switches X' and X^2 are normally open, but switch X' is closed by an upward movement of rod S^2 somewhat less than that required to give a permissive signal indication, and switch X^2 is closed by an upward movement of the rod slightly greater than that required for a permissive indication. Switches X' and X^2 after being closed remain closed until the rod S^2 moves below the closing position. Switch X^3 is normally closed, but is opened when the rod S^2 moves above the normal position. The energization of the slot winding R is dependent upon the condition of the track relays of the block and the closure of certain switches under the manual control of the signal operators at the two ends of the block, and I will remark that the instruments and devices at station A may be, and under ordinary conditions are, exactly duplicated at the end of the block remote from that at which station A is located.

The quadrant S^{12}, in which the lever S^8 is mounted, is provided with a housing for a mechanical latch or sliding bolt T, which is normally spring held in the position in which it bars the movement of the lever S^8 beyond the cautionary or permissive signal setting position. The bolt T is formed with a hole T^2 through which a locking pin U^2, carried by the armature U' of magnet U, projects when the magnet is deënergized. When the bolt T is freed from the locking pin U^2, it may be moved out of the path of lever S^8 by engaging the knob T^3.

It will be observed that the bolt or latch T is separate from the usual means conventionally shown and indicated by the symbol S^{15} for holding the signal lever S^8 in any one of the three positions into which it may be adjusted. The bolt or latch releasing knob T^3 is out of proximity to the lever proper, and the operator cannot release this latch and simultaneously shift the lever with one hand in a practically automatic manner as he can do with a switch actuating mechanism provided with such a holding device as is indicated by S^{15}.

At each station there are located two indicator magnets I' and i'. One I' is energized when the circuit connections are such that a full clear signal indication may be had, and the other, i', when a permissive indication may be had.

The armature I of magnet I' is connected by an arm I^2 and link I^3 to a target or indicator I^4, which, when magnet I' is energized, is thrown into view through the opening B' in a cover B which normally conceals the target. This target may be marked in any suitable manner to indicate its character, as by the words "Block clear." Similarly, armature i controls a target i^4 through link i^3 and arm i^2. Target i^4 may be marked "Train in block." When neither of magnets I' nor i' is energized, a legend "Instrument free" is visible through opening B'. The magnets I' and i' and connected parts, and the stick magnet G, emergency circuit breaker L and three way switch J, hereinafter described may be all inclosed in a single compact case, of which the cover plate B forms one wall. It will be understood, of course, that the key F hereinafter described and the handles of switch J and circuit breaker L should project through the wall of this case.

From the station A, a conductor 1 runs to the other end of the block. This conductor is unbroken between the block ends

and is the common or return line of the system. From the station A in the arrangement shown, two signal lines 12 and 20 run to some intermediate portion of the block, at which is located what I term an interlocking relay E. Similar lines 12 and 20 run between the relay E and the remote station.

As the particular construction of the interlocking relay E forms no part of the present invention and is fully described and illustrated in my said prior application, I will not describe it herein further than to say that when the block is entirely free from trains, it serves to connect the two lines 12, and when the block contains trains, it serves to connect the line 20 from the station at which the trains have entered the block with the line 12 from the station at which the trains are to leave the block.

When it is desired to actuate the signal at one end of the block, the operator at the remote end of the block closes certain circuit connections which connect a source of current between the line 12 and the line 1 at his station. The operator at station A, for instance, supplies current for the clearance of the signal at the other end of the block by depressing a hand key F which throws up the armature G′ of a magnet G, which I call a stick magnet, and thereby connects the adjacent end of the line 1 to the line 2. The line 2 runs to one terminal of the stick magnet G. The other terminal of the magnet G is connected by a line 3 and conductor 4 to one terminal of a source of current such as the battery Q. The other terminal of the source of current Q is connected by conductors 5 and 6 and switch X^3 to the switch point 9 of a three way switch J. The three-way switch J, in the form shown, comprises switch contacts 7, 8, 9, 10 and 11, and a pair of switch blades connected by an operating handle in the usual manner with one switch blade permanently electrically connected to the contact 8, and the other blade permanently electrically connected to the contact 10. When the switch blades are thrown to the right of the position shown, the right hand switch blade connects the contacts 10 and 11, and the contacts 7, 8 and 9 are disconnected. When the switch blades are thrown to the left of the position shown in the drawings, contacts 7 and 8 are connected by the left switch blade, and the contacts 9, 10 and 11 are disconnected from each other. When the three-way switch J is in the intermediate position shown, the switch point 9 is electrically connected to the switch point 8 and the contacts 7, 10 and 11 are disconnected from each other. The conductor 12 is connected to the switch-point 8. Provided the circuit connections at the remote end of the block are properly established, the closure of lines 1 and 2 thus causes current to be sent from the source Q at station A through a circuit, including the common line 1 and the line 12 to the interlocking relay, and from there either the other line 12, or the line 20 leading away from the interlocking relay. So long as this circuit is closed, magnet G retains armature G′ and when broken, the latter falls. Preferably, I arrange an indicating device to show when armature G′ falls. In the form shown, the indicator is a bell G^2 engaged when armature G′ drops by a striker carried by the armature. The striking of this bell indicates that the circuit of magnet G is broken and this means normally that a train has entered the block at the other end. If, as in case of emergencies, an operator, after having moved key F to permit a signal to be cleared at the other end of the line, wishes to prevent such clearance, he can do so by opening the circuit breaker L. Similarly, when a signal is to be cleared at station A and the operator at the remote station performs his part, current is supplied to the station A through the circuit including line 1, line 12 between the remote station and relay E, and either line 12 or line 20 between relay E and station A. When current is supplied to station A by lines 1 and 12, the signal S may be fully cleared, and when supplied by lines 1 and 20, the signal may be set in the intermediate position only.

I will first describe the connections and mode of operation by which the signal is set in the full clear position. As a a prerequisite to giving a full clear signal indication at station A, the operator there must throw the three-way switch J to the left, thereby connecting the switch contacts 7 and 8. The absolute signal clearing conductor 12 is connected to the switch contact 8 and a conductor 13 runs from the switch contact 7 to one terminal of the switch indicator magnet I′. The other terminal of the switch indicator magnet I′ is connected to one end of a conductor 14, the other end of which is connected through an armature of track relay M^2, when the latter is energized, to a conductor 15 which is connected to the common conductor 1 through the armature G′ of the stick magnet G when the latter is deënergized. With the circuit connections described when the three-way switch at station A is in the proper position and the operator at the remote station has connected a source of current between his conductor 12 and the common conductor 1, and the two conductors 12 are connected by the interlocking relay E, a flow of current is set up which energizes the magnet I′ and throws the target I^4 in front of the opening B′ of the shield B. When the indicator magnet I′ is energized, its armature I closes connection between the conductors 19 and 16. Conductor 19 is con-

nected to one side of the battery Q at station A by conductors 3 and 4, and the conductor 16 forms part of a circuit running to the other side of the battery Q, and including, besides conductor 16, the conductor 17, slot winding R and conductor 5. By these means the slot winding R is energized from the battery Q. This enables the signal to be moved out of the normal danger position by the signal actuating lever S^8. When the armature I is attracted by the energization of magnet I', it also connects conductors 19 and 24, and this causes the energization of the lock magnet U through a circuit including the battery Q, portions of conductors 5 and 6, conductor 25 including winding of magnet U, conductor 24, armature I of indicator magnet I', conductor 19 and conductors 3 and 4 to battery Q. When lock magnet U is energized, the armature U' is attracted and the locking pin U^2 is moved out of the hole in the mechanical locking plunger or latch T. When the latch T is thus freed, the signal lever S^8 may be moved into the position in which the signal gives the full clear indication. As the signal is moved beyond the intermediate position into the full clear position, the collar S^{10} on rod S^2 engages and closes switch X^2 so that the subsequent deënergization of magnet I' will not of itself cause the breaking of the circuit for energizing lock magnet U.

The line 20 is connected at station A to the switch contact 11 of the three-way switch J, and when a full clear signal indication is improper and the operator at station A desires to set his signal S in the intermediate position, he must throw the switch J to the right so that it connects switch points 10 and 11. From switch point 10, a line 21 leads to the armature U' of the locking magnet U. In the normal position of the parts shown in Fig. 1, the pin U^2 carried by the armature U' passes through the hole T^2 in bolt T and engages a contact to which is connected conductor 22. The conductor 22 leads to one terminal of magnet i'. The other terminal of the magnet i' is connected to one end of the line 14. The other end of line 14, which, as has been pointed out, is connected to conductor 15 by one armature of track relay M^2 when the latter is energized, while conductor 15 is connected to return line 1 through armature G of the stick magnet G' when the latter is deënergized.

The switch connections described result in energizing the indicator magnet i' and the energization of the latter moves the target i^4 into view through the opening B' in the cover B exposing the indication "Train in Block". The energization of magnet i' lifts its armature i and this connects conductor 23 with the conductor 18 and thereby closes an energizing circuit through the slot magnet R, the circuit including the battery Q, conductor 5, conductor 17, conductor 18, armature i, conductor 23 and conductor 4. The energization of the slot R permits the actuation of the signal S by the signal lever S^8; but in this case the lever S^8 is prevented from being moved beyond the intermediate position by the latch T which is locked in the latching position by the pin U^2. It is to be observed that the slot circuit controlled by the indicator magnet i' cannot be closed unless the latch T is locked in the path of the lever S^8, since the energizing circuit of magnet i is closed only when the armature U' and pin U^2 are in the locking position and thereby serve to connect conductors 21 and 22, and this can only occur when the latch T is in the position in which the pin U^2 passes through the hole T^2 in the latch T.

It will be observed that the signal at station A can be moved out of the normal danger position only when the block section between joints Z^2 and Z^3 is free from trains. In both cases the circuit for energizing the indicator magnets I' and i' includes conductors 14 and 15, which are electrically connected together by an armature of track relay M^2 when and only when track relay M^2 is energized. This is as it should be since the signal should never be cleared to admit the train into the block until after a preceding train has moved beyond the short track section between joints Z^2 and Z^3.

It is desirable in many cases to maintain the clearance of the signal after it has once been cleared, however, until the rear end of a train admitted to the block by the signal has passed by the signal. For instance, in the case of long freight trains, such provision makes it possible for the train men at the rear of the train to learn definitely in most cases that the engineer has not passed the signal without having a right to do so.

In the present case, I have disclosed means for maintaining the energization of the slot winding until the rear end of the train admitted by the signal has passed into the block and beyond the first section thereof. These means comprise a shunt about the indicator magnet controlling portions of the slot winding energizing circuit. This shunt includes a conductor 26 connected at one end to the conductor 17, and including the switch X' and connected at the other end to conductors 27 and 28. The conductor 27 is connected to the conductor 29 by the lower armature of track relay M^2 when the latter is deënergized and the conductor 29 is connected to a conductor 30 by the armature of track relay M when the latter is energized. Conductor 30 is connected by conductor 31 to conductor 4. The conductor 28 is connected to the armature of track relay M' and the latter, when the armature is deënergized, is connected to the conductor 4 by conductor 31.

The switch X′ is controlled by the collar S^9 on the signal actuating rod S^2 and is open when the signal is in the danger position and is closed when the signal is either in the cautionary or clear position. The track relays M and M′ are deënergized when a train occupies any portion of the block section between joints Z′ and Z^2, and relay M^2 is deënergized when a train occupies any portion of block section between joints Z^2, and Z^3. When a train passes into the block section between joints Z^2 and Z^3 from the section between joints Z′ and Z^2 and magnet M^2 is deënergized, the main slot circuit is broken because of the deënergization of magnet I′, or *i*′, as the case may be. The switch X′ being closed, however, the deënergization of M^2 does not affect the auxiliary slot circuit between conductors 17 and 4. This circuit includes conductors 26 and 28, armature of magnet M′, which, of course, is deënergized at this time, and line 31. Nor is the auxiliary slot circuit broken when the rear end of the train passes by joints Z^2, for magnet M is arranged to have a smaller time constant than magnet M′. In consequence, magnet M picks up its armature before magnet M′ does. As a result of this, conductor 26 is connected to line 4 by conductor 27, armature of magnet M^2, conductor 29, armature of magnet M, and conductors 30 and 31 before the connection between conductors 28 and 31 is broken by the picking up of the armature of magnet M′. Normally, therefore, the signal S having been cleared to permit a train to pass joint Z^2 remains cleared until the train passes Z^3. After the train has passed joints Z^3, the energization of magnet M^2 breaks the auxiliary slot circuit and momentarily at least deënergizes the slot winding and the signal returns to danger. Should a following train enter the section between joints Z′ and Z^2 before the preceding train has passed beyond Z^3 the auxiliary circuit is broken, for the deënergization of M breaks the connection between conductors 29 and 30 and this break occurs before lines 28 and 31 are connected by the armature of magnet M′.

While the arrangement described normally permits the signal indication which admits a train to the block to be maintained until the rear end passes through the first section of the block, it effectually prevents the maintenance of the signal indication after a following train enters the preceding block section.

In the form of the invention shown in Fig. 4 where the signal is not manually actuated but is electrically operated, the devices, L, F, G, J, Q, I, *i*, I′, *i*′, I^2, i^2, I^3, i^3, I^4 and i^4, at each signal station may be substantially the same and be controlled in the same general way as those shown in Fig. 1, though certain of the circuit connections are changed, and of course there is no signal actuating lever or electrically controlled mechanical latch.

In the arrangement shown in Fig. 4, the signal S is actuated by an electrical mechanism M, which may be similar to any of the well known electrical signal actuating mechanisms now in use for operating a three position signal. Q′ is the battery for supplying current to the mechanism M, and V is a polarized magnet provided with two armatures V′ and V^2. When magnet V is energized by a current flow in either direction of proper intensity, the armature V′ is attracted and connects a conductor 40 running from one terminal of M to the conductor 43 running from one terminal of the battery Q^1. The other side of the battery Q^1 is connected by a line 42 to another terminal of the mechanism M. The third terminal of the mechanism M is connected by a conductor 41 and armature V^2 to the conductor 40 when the armature V^2 is in its normal position, but this connection is broken when the armature V^2 is attracted by polarized magnet V. The armature V^2 is attracted by the magnet U only when the current flow through the magnet is in one certain direction, and is not affected by a current flow through the magnet in the opposite direction. With the arrangement shown, the mechanism M moves the signal S from the horizontal danger position, shown in full lines, into the dotted line vertical position— the full clear position,—when the current flow through magnet V is such that the armature V^1 is attracted while the armature V^2 is not attracted. When both armature V^1 and V^2 are attracted, the mechanism M sets the signal in the intermediate dotted line, or cautionary position.

The initial energization of the armature V is controlled by the magnets I′ and *i*′. The magnet I′ is energized as before described when a full clear signal indication is proper, and the armature *i*′ is energized when a permissive signal indication is proper. The energization of these magnets in Fig. 4 is controlled substantially in the manner and by the means hereinbefore described in connection with Fig. 1. Conductors 21 and 22 and connecting means of Fig. 1 are replaced in Fig. 4 by a single conductor 21′ however. The armature I is connected by conductor 33 to one side of the magnet V and including resistance R for a purpose hereinafter described. Similarly, a conductor 34 connects the other side of the magnet V with the armature *i*. Each of the armatures, I and *i*, when in its retracted position is connected by a conductor, 35 or 36, respectively, and by a conductor 37 to the conductor 4, and by the latter to the positive side of the battery Q. The lines

16 and 18 are connected by a conductor 17′ and conductor 5 to the negative side of the battery Q. When magnet I′ is energized, current flows from the positive side of the battery Q through conductors 4, 37, and 36, armature *i*, conductor 34, polarized magnet V, conductor 33, armature I, conductors 16, 17′ and 5, back to the negative side of the battery Q. This flow of current causes armature V′ to be picked up, but not armature V^2. This, as before explained sets the signal in the full clear position. When magnet *i* is energized, (magnet I then being deenergized, of course) a current flow through the polarized magnet V from the battery Q is set up in a direction opposite to that before described through the following circuit; conductors 4, 37 and 35, armature I, conductor 33, magnet V, conductor 34, armature *i*, conductors 18, 17′ and 5, back to the negative side of the battery Q. The energization of magnet V by a flow of current through the circuit just described, results in attracting both armatures V′ and V^2 and in setting the signal in the intermediate position.

To obtain the same rear end control of the signal S as is obtained in the arrangement shown in Fig. 1 by the use of the auxiliary slot circuit, I have provided a similar arrangement in the form of the system shown in Fig. 4 for maintaining a shunt energizing circuit for the polarized magnet V, about the portion of the initial energizing circuit therefor, containing armatures I and *i*. This shunt includes conductors 38 and 39 connected to conductors 33 and 34 respectively, and to the blades of a two blade switch X^4. The switch X^4 is set in different positions corresponding to the different positions in which the signal S is set. In the diagrammatic representation shown, the rod S^{13} is connected at one end to the signal blade and at the other end to one arm of a bell crank lever S^{14}, and the other arm of the bell crank lever S^{14} is connected to the switch X^4. The switch X^4 controls connection between the lines 38 and 39 and 31′ and 26′. When the signal S is in the horizontal, or danger position, switch X^4 does not operatively connect the conductors 38 and 39 to the conductors 31′ and 26′. When the switch X^4 is in an intermediate position, however, corresponding to the intermediate or cautionary position of the signal, conductor 38 is connected to conductor 31′, and conductor 39 to conductor 26′. In the position of the switch X^4 corresponding to the full clear signal indication, conductor 38 is connected to a branch 26″ of the conductor 26′, and conductor 39 is connected to the conductor 31′. The conductor 31′ includes a battery Q^2 and is connected to the lines 31 and 30. The conductor 26′ is connected to the conductors 27 and 28.

It will be apparent without detailed explanation that after the signal, is set in either the intermediate or full clear position to permit a train to move past the joints Z^2, the connections controlled by the relays M, M′ and M^2, will serve to connect the lines 31′ and 26′ in the same manner and under the same conditions as these relays connect conductors 4 and 26 in the arrangement shown in Fig. 1, and that, in consequence, a current flow is then set up through the circuit including the battery Q^2 and conductors 31′ and 26′, switch X^4, conductors 38 and 39, portions of conductors 33 and 34 and polarized magnet V, in the same direction as the current flow through the magnet V from the battery Q which initially set the signal in the full clear or intermediate position. To prevent the conductors 33 and 34, armatures I and *i* and conductors 35 and 36 from serving as a low resistance shunt about the magnet V for current from the battery Q^2 after the train movement has served to deenergize indicator magnet I′ or *i*′ as the case may be, the resistance R is inserted in the initial energizing circuit of the polarized armature U. This resistance should be great enough on one hand to prevent any substantial diversion from battery Q^2 in the shunt circuit about the polarized magnet V, described, and on the other hand of course should be small enough to permit the magnet V to be energized from the battery Q without making the voltage of the latter unduly large.

In accordance with the provisions of the statutes I have illustrated and described the best forms of my invention now known to me, but it will be apparent to those skilled in the art that changes can be made in the form of the apparatus disclosed without departing from the spirit of my invention.

It will also be apparent to those skilled in the art that certain features of the invention may sometimes be used with advantage without a corresponding use of others.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a block signal system, the combination with a pair of block sections and a signal governing the passage of trains into one of said sections from the other, of electric controlling mechanism for the signal, devices automatically responsive to the presence of trains in said block sections, means controlled by one of said devices for preventing the initial energization of said mechanism when said one section is occupied by a train, and means controlled by said devices for maintaining the energization of said mechanism on the passage of a train into said one section from the other section and until the rear end of the train passes through said one section so long as no other

train enters said other section, said last mentioned means being rendered inoperative by the entrance of another train in said other section.

2. In a three position signal mechanism, the combination with a signal and an actuating device therefor adapted upon a limited movement to move the signal from the danger position to an intermediate position, and on a further movement to move said signal into a third position, of a manually actuated mechanical latch normally preventing the movement of the actuating device to set the signal in a third position, and an electric lock for said latch.

3. In a three position signal mechanism, the combination with a signal actuating lever, of a stand in which the lever is mounted, a latch mounted in said stand and movable into and out of the position in which it projects into the path of the lever and prevents the latter from being moved beyond the intermediate position into the clear position, but not interfering with the movement of the lever into the intermediate position, a spring normally holding the latch in its said position, and a handle by which the latch may be manually retracted from its said position.

4. In a three position signal mechanism, the combination with a signal actuating lever, of a stand in which the lever is mounted, a latch mounted in said stand and movable into and out of, and having provisions whereby it may be manually moved out of, the position in which it extends across the path of the lever and prevents the latter from being moved beyond the intermediate position into the clear position, yielding means normally holding the latch in its said position, a locking part normally engaging said latch and positively holding it in its said position, and electro-magnetic means for moving said locking part to free the latch.

5. In a block signal system, the combination with a manually actuated electric slot controlled signal and the electric slot thereof, of devices automatically responsive to the presence of trains in different portions of the block, means controlled by said devices for permitting the energization of said slot when the section of the block adjacent the signal is free from trains, but preventing said energization when said section has a train in it, a lock normally preventing the movement of the signal beyond an intermediate position, and lock releasing means also controlled by said devices, effective only when the block is entirely free from trains, for initially releasing the lock.

6. In a block signal system, the combination with a signal, of a manually actuated signal setting lever, a latch movable into and out of the position in which it prevents the movement of the lever beyond an intermediate position, a locking part adapted to engage and hold the latch in said position, and electro-magnetic means for moving said locking part to free said latch, said means being automatically responsive to the presence of trains in the block to which the signal pertains and being capable of moving the locking part out of engagement with the latch only when said block is entirely free from trains.

7. In a block signal system, the combination with a signal, of a manually actuated signal setting lever, a latch movable into and out of the position in which it prevents the movement of the lever beyond an intermediate position, a locking part adapted to engage and hold the latch in said position, electro-magnetic means for initially moving said locking part to free said latch, said means being automatically responsive to the presence of trains in the block to which the signal pertains and being capable of moving the locking part out of engagement with the latch only when said block is entirely free from trains, and means controlled by the position of the signal for maintaining said locking part out of the position in which the latch is free, regardless of the presence of trains in said block after, and while, the signal is beyond its intermediate position.

8. In a block signal system, the combination with devices automatically responsive to the presence of trains in different portions of the block, of a signal, a manually actuated signal setting lever connected to said signal, a latch movable into and out of the position in which it prevents the movement of the lever beyond an intermediate position, a locking part adapted to engage and hold the latch in said position, electro-magnetic means for moving said locking part to free said latch, said means being controlled by said devices and prevented thereby from moving the locking part out of engagement with the latch except when the block to which said signal pertains is free from trains, an electric slot in the connections between the lever and signal, and means controlled by said devices and the position of said locking part adapted to energize said slot when said locking part engages and holds the latch in said position, and a particular portion of the block is free from trains, although another portion of the block may be occupied by trains.

GEORGE S. PFLASTERER.

Witnesses:
GEO. F. BLACKIE,
C. W. GRANT.