W. J. COOK.

RAILWAY SIGNALING MECHANISM.

APPLICATION FILED MAR. 25, 1911.

1,037,871.

Patented Sept. 10, 1912.

6 SHEETS—SHEET 1.

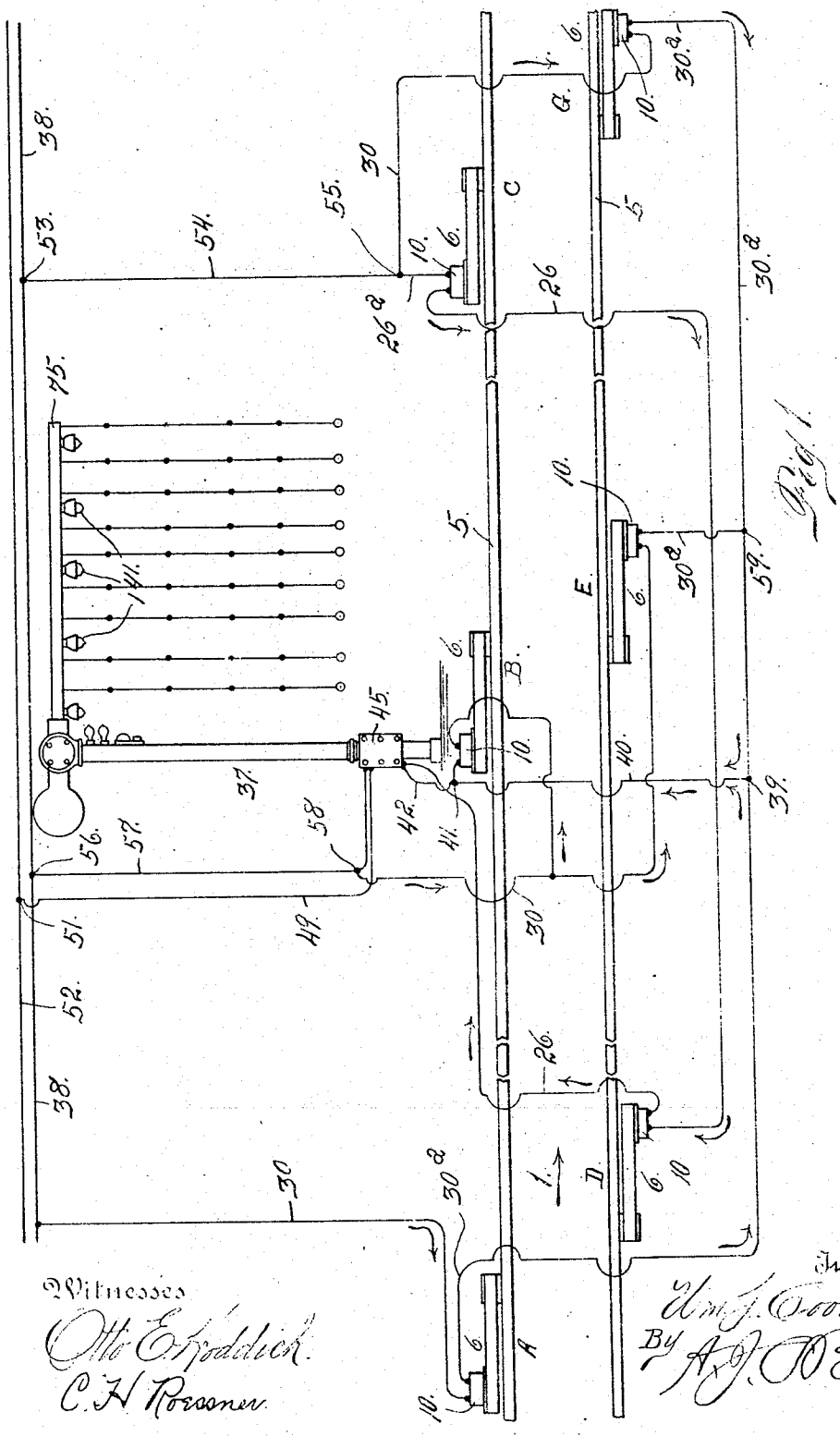

Fig. 1.

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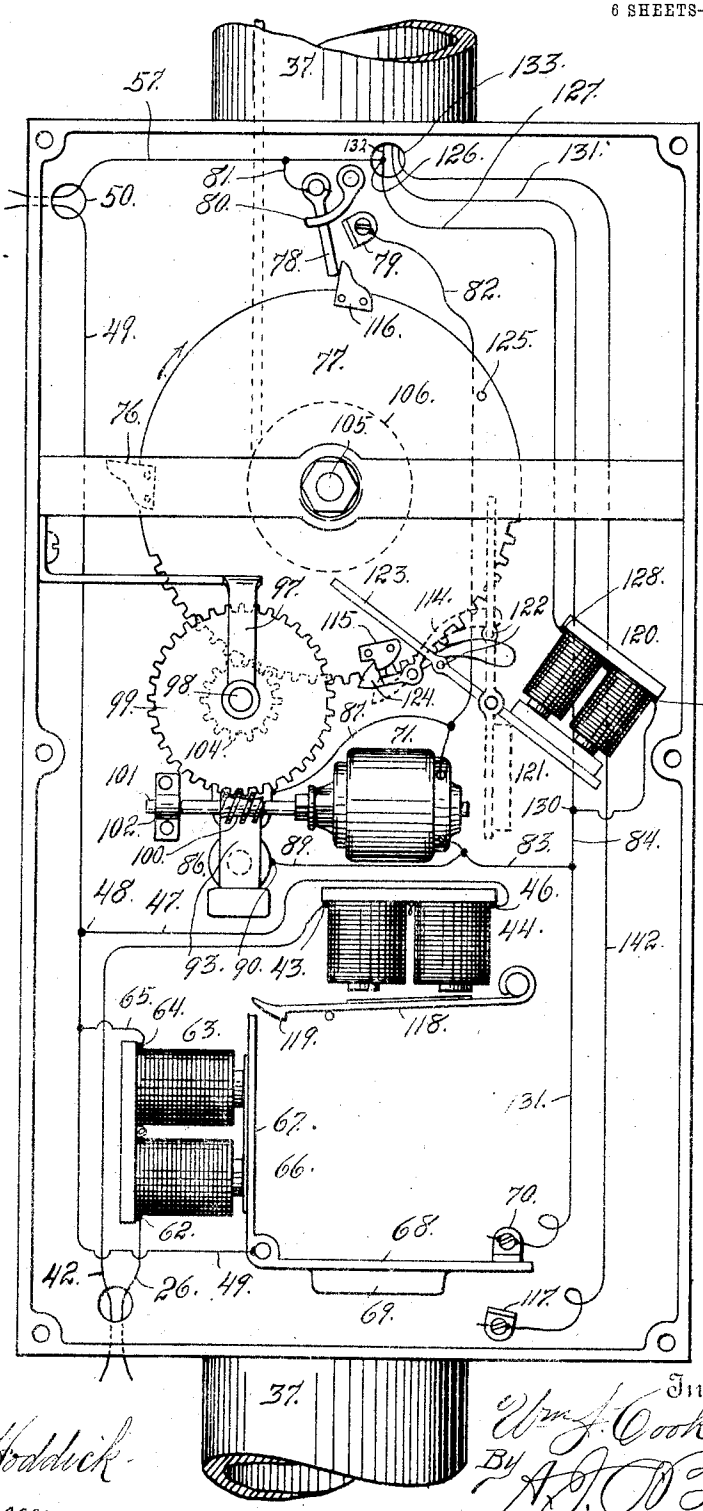

Fig. 2.

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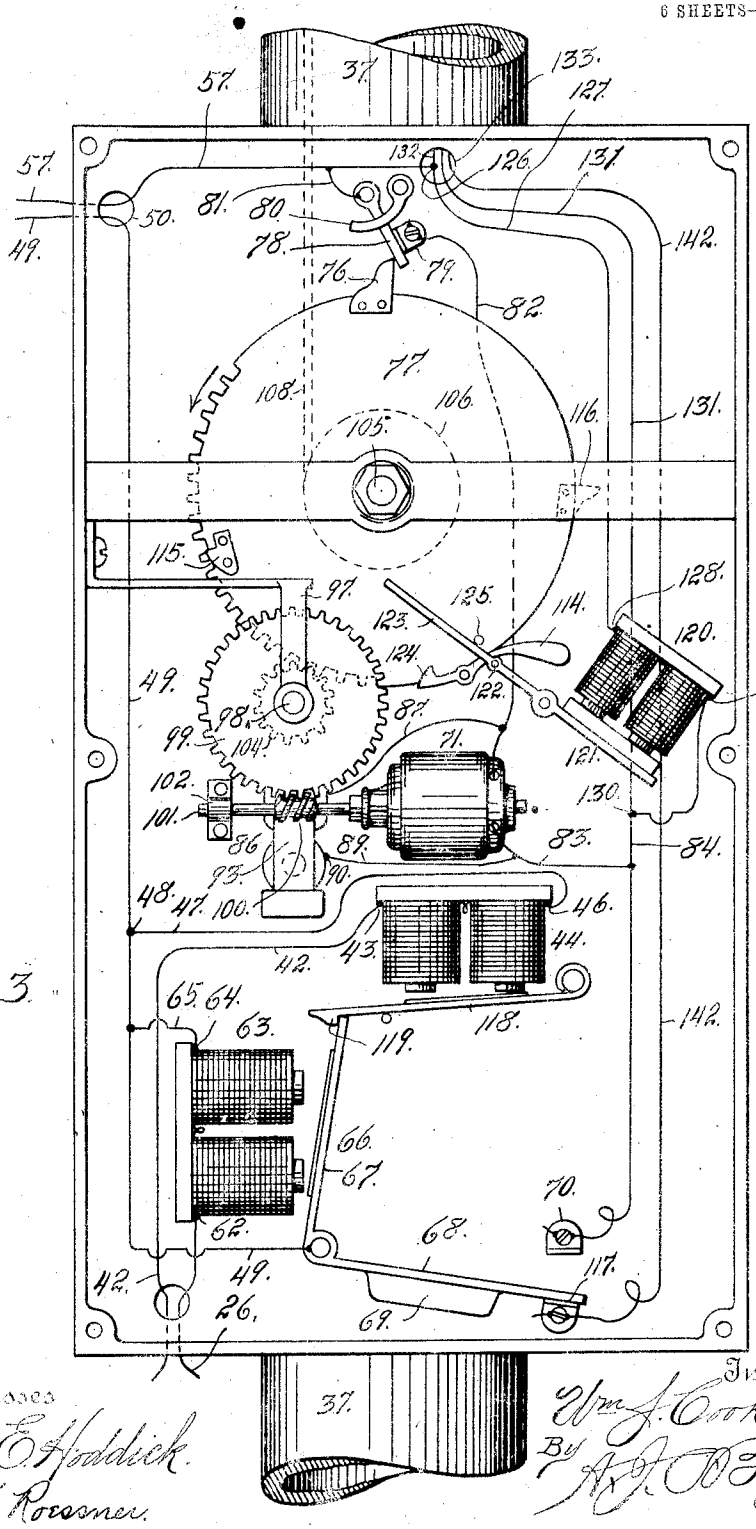

Fig. 3.

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Fig. 4.

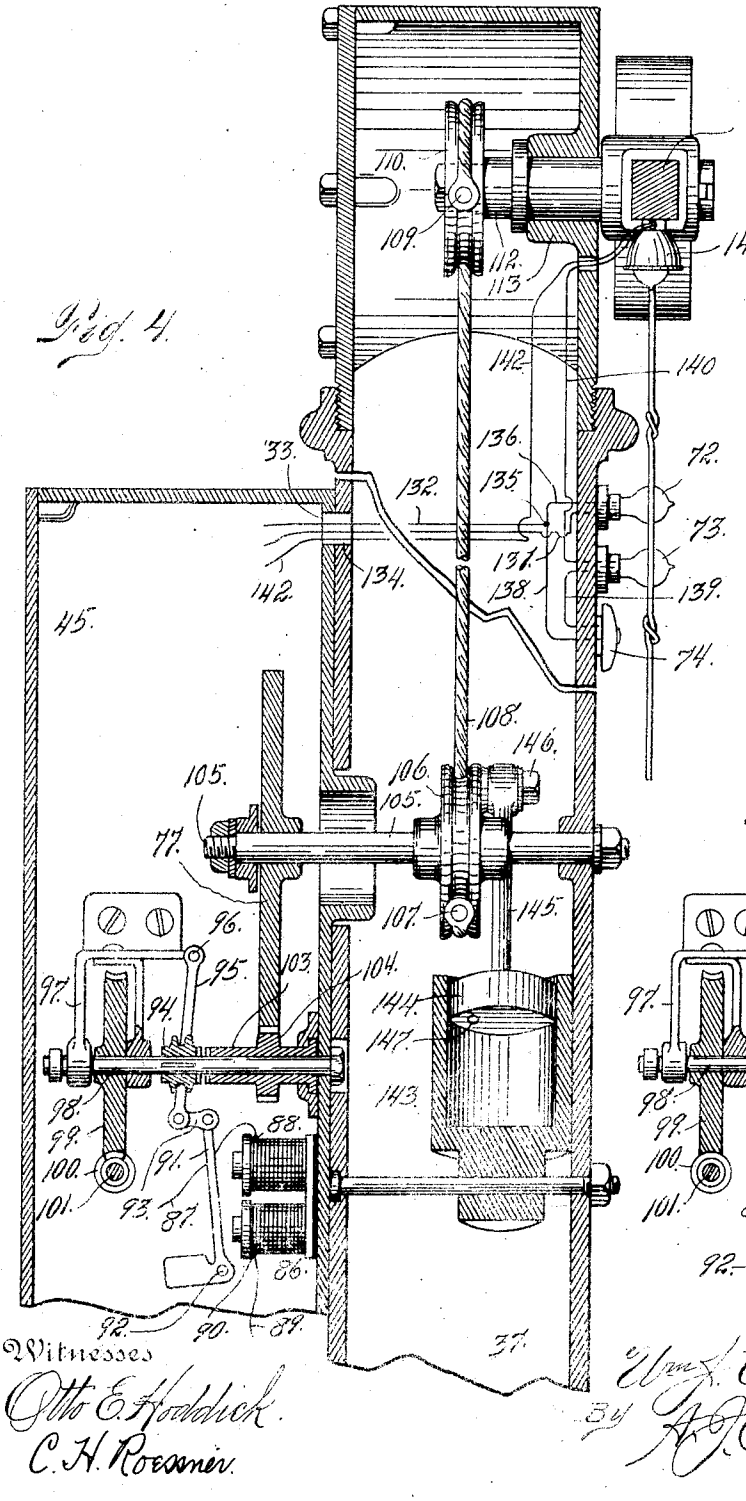
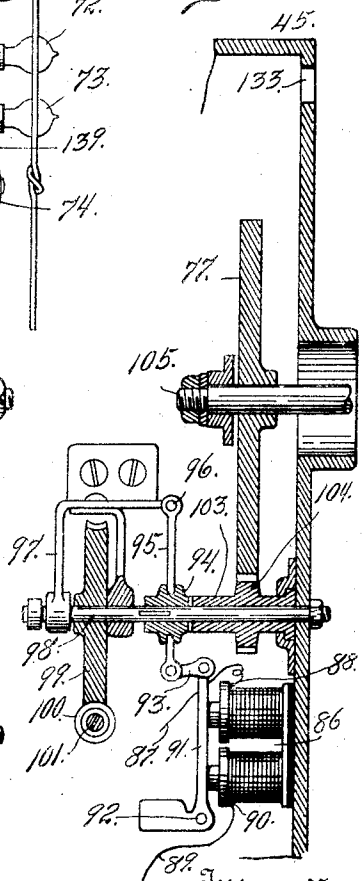


Fig. 5.



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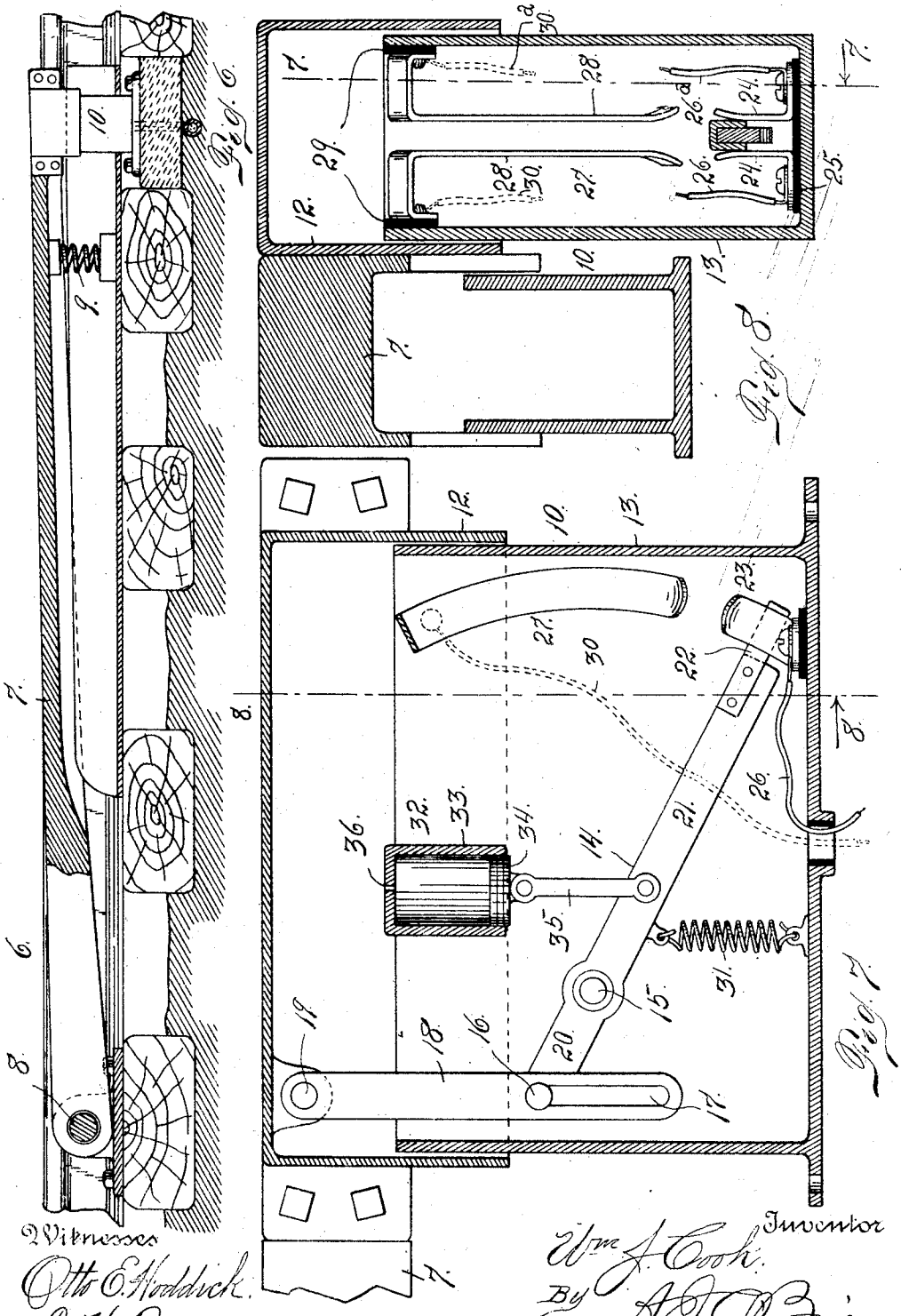

Witnesses

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6 SHEETS—SHEET 6.

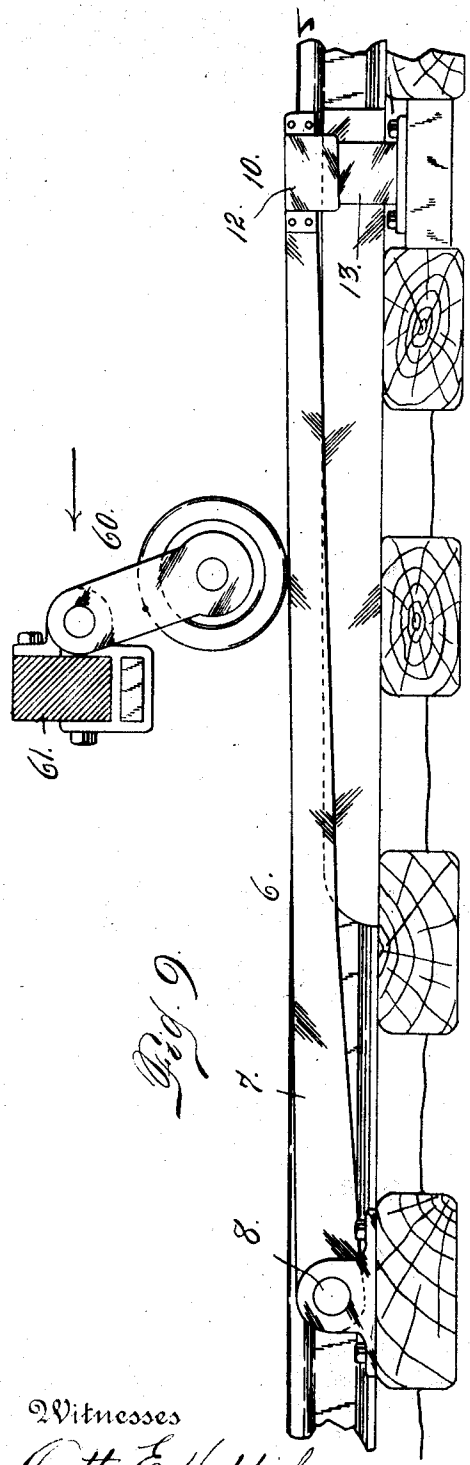

Fig. 9.

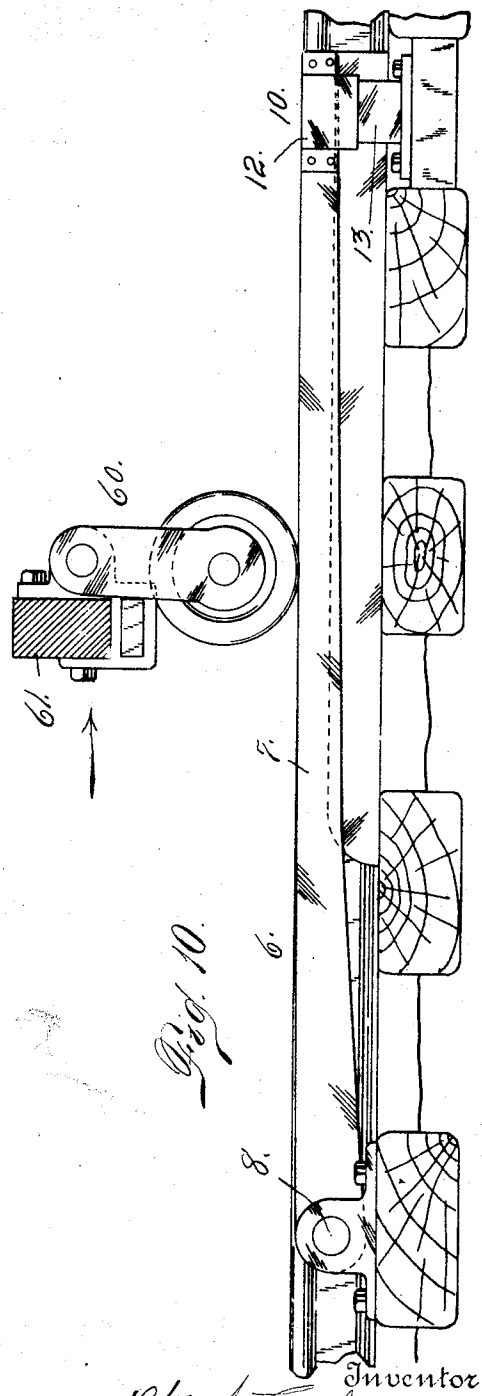

Fig. 10.

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UNITED STATES PATENT OFFICE.

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RAILWAY SIGNALING MECHANISM.

1,037,871. Specification of Letters Patent. Patented Sept. 10, 1912.

Application filed March 25, 1911. Serial No. 616,976.

To all whom it may concern:

Be it known that I, WILLIAM J. COOK, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Railway Signaling Mechanism; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in railway signaling mechanism, but more specifically, as illustrated in the drawing, to means for automatically operating signals at railway crossings, whereby danger signals shall be displayed as trains approach the crossing in either direction.

My improved construction embraces contacts arranged along the track and so connected with the signal that these contacts automatically control circuits in which the signaling devices are located, whereby the danger signal shall be displayed as the train approaches the crossing, while the signal shall be thrown to the safe position as the train leaves the crossing.

It also includes means carried by the train and adapted to act upon these contacts for the aforesaid purpose, on one side of the track, namely on the right-hand side, the train devices being inactive in connection with the signals on the left-hand side of the track, except when the train is backing up, in which event the devices carried by the train will operate the contact devices on the left-hand side of the track, considered with reference to the train's forward movement.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a diagrammatic view illustrating the circuit connection with the signals arranged along the track. Fig. 2 is a view illustrating the devices for operating the signaling mechanism, the same being shown on a relatively large scale, the supporting post being broken away at the top and bottom. Fig. 3 is a similar view showing the same mechanism in different relative positions. Fig. 4 is a sectional view illustrating a portion of the mechanism broken away from the top of Figs. 2 and 3. Fig. 5 is a fragmentary detail view of a portion of the mechanism shown in Fig. 4, the parts being in different relative positions. Fig. 6 is a sectional view taken through one of the contact devices arranged along the track. Fig. 7 is an enlarged sectional view illustrating a portion of the contact mechanism embraced in the construction shown in Fig. 6, the parts, however, being illustrated on a much larger scale. This may be termed a section taken on the line 7—7, Fig. 8. Fig. 8 is a section taken on the line 8—8, Fig. 7. Fig. 9 illustrates one of the contact devices shown in connection with a device carried by the train and adapted to act thereon, the train device, however, being inactive by reason of the direction of travel of the train as indicated by the arrow. Fig. 10 is a similar view illustrating the same mechanism, it being assumed, however, that the train is traveling in the opposite direction as indicated by the arrow, thus making the train device operative with reference to the contact, the operating members of the latter being accordingly shown in the depressed position.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the track rails along which are arranged make-and-break devices 6, the said devices being located on opposite sides of the track, but reversely arranged. Each of these make-and-break devices 6 comprises a lever 7 fulcrumed at 8, its extremity remote from the fulcrum being normally supported in the raised position by a spring 9. Beyond the spring is located a box 10 closed by the lever 7, which constitutes a sort of housing, as best illustrated in Figs. 7 and 8. The housing feature of the lever exists by reason of the fact that the upper face thereof is provided with depending flanges or plates 12 which extend beyond the sides 13 of the box 10. By virtue of this fact the housing lever structure coöperates telescopically with the sides 13 of the box 10, whereby the latter is always closed at the top whether the housing lever is depressed or raised.

This construction protects the mechanism within the box. This mechanism consists of a lever arm 14 fulcrumed at 15, the short arm of the lever having a wrist pin 16 protruding through and movable in a slot 17 formed in a link 18 pivotally connected with the top of the housing lever on the inside as shown at 19. The wrist pin 16 is connected with the short arm 20 of the lever. The long arm 21 of this lever is provided at its extremity remote from the wrist pin 16, with a contact member 22 which normally engages the bifurcated contact 23 composed of two members 24 separated to receive the contact 22, when the cooperating parts are in engagement. The contact members 24 are insulated from the box 10 as shown at 25, the branches of the contact being respectively connected with electrical conductors 26 and 26^a. When the housing lever 7 is depressed by the action of a train device as hereinafter more fully explained (see Fig. 10), the link 18 will be forced downwardly and the long arm of the lever 21 raised to cause its contact extremity 22 to engage a relatively long bifurcated contact 27 mounted in the upper part of the box 10, this contact 27 being composed of two separated members 28 insulated from the box as shown at 29. Conductors 30 and 30^a may be respectively connected with the said members of the contact 27. Attention is called to the fact, however, that when the contact 27 is connected with conductors 30 and 30^a respectively, the contact members 23 are disconnected, and vice versa. In other words, in one form of the contact mechanism, namely that in which the conductors are shown in full lines in Figs. 7 and 8, the circuit is normally closed, while in the other form of construction, namely that in which the conductors are indicated by dotted lines in Figs. 7 and 8, the circuit is normally broken through the make-and-break devices 6.

By virtue of the fact that the long arm 21 of the lever 14 is heavier than its opposite arm, and by reason of the employment of a spring 31 connected with the long arm of the said lever (see Fig. 7), the long arm normally occupies its lowermost position within the box 10, whereby its contact 22 is in engagement with the bifurcated contact 23. Hence after the housing lever 7 has been depressed, the lever arm 21 has a tendency to move downwardly from engagement with the contact 27 to engagement with the contact 23. In order that this operation may not take place too quickly after the passage of a train, a dash pot 32 is employed, the same being mounted in the box 10 and composed of a cylinder 33 and a piston 34, the piston being connected by a link 35, with the long arm of the lever 14. The dash pot is provided at the bottom of the cylinder with a relatively small port 36 for the entrance and escape of air in the usual manner.

The manner of controlling the various members of the signal operating mechanism illustrated in Figs. 2 to 5 inclusive, by the operation of the make-and-break devices 6, will now be described. For convenience of description the positions of the make-and-break devices 6 from left to right in Fig. 1 will be designated A, B and C, on the left-hand side of the track, assuming that the train is traveling toward the right, as illustrated by arrow 1 placed between the two track rails; while the positions of the make-and-break devices 6 on the right-hand side of the track will be designated D, E, and G. Referring now to these contacts by the reference letters which are employed to designate their positions only, the make-and-break device 6 in position A on the left-hand side of the track has the circuit therethrough normally broken by reason of the fact that the bifurcated member 27 in the box 10 has the circuit wires 30 and 30^a connected therewith, while the corresponding member 23 is devoid of circuit wires. Hence in this event, as the lever arm 21 is normally in its lowermost position, whereby its contact 22 is in engagement with the corresponding member 23, the circuit is broken, and as this condition exists in the make-and-break device 6 in position A, the circuit will be interrupted through a portion of the signal operating mechanism carried by the post 37, and the interrupted circuit may be traced as follows: from the feed wire 38 (see Fig. 1), through a conductor 30, to one of the members 28 of the contact 27 within the box 10 of the make-and-break device in position A, and thence through the circuit wire 30^a from the other member of said contact 27, out of the said box, and thence through the contact 30^a to a point 39, thence through a conductor 40 to a point 41, thence through a conductor 42 to one terminal 43 of a magnet 44 within the casing 45 carried by the post 37, thence from the opposite terminal 46 of said magnet through a conductor 47 to a point 48, thence through a conductor 49, out of an opening 50 in said box, to a point 51 on the opposite feed wire 52. Having thus traced the interrupted circuit through the make-and-break devices in position A, it will be seen that the magnet 44 is normally deënergized. This same magnet 44 is also controlled by the make-and-break device 6 in position G on the right-hand side of the track, but the circuit is also normally broken through this make-and-break device G, and the circuit may be traced through the circuit make-and-break device in the last named position as follows: Beginning with a point 53 on the feed wire 38, the current may be said to pass through

a conductor 54 to a point 55, thence through a conductor 30 to one of the members 28 of the contact 27 of the make-and-break device 6 in position G, thence through a conductor 30^a leading from the other member of the same contact, the current may be said to pass (if the circuit were closed through the make-and-break device in this position), through the conductor 30^a to the conductor 40, and thence through the magnet 44 and to the point 51 on the feed wire 52 in the same manner as heretofore explained when following the circuit through the make-and-break device 6 in position A. The magnet 44 is also controlled through the make-and-break device 6 in position E on the right-hand side of the track, and the circuit connections through the make-and-break device 6 in the position E may be traced as follows: Beginning at a point 56 on the feed wire 38, a conductor 57 leads to a point 58. From this point a conductor 30 leads to one of the members of the contact 27 within the box 10 of the make-and-break device 6 in position E, and a conductor 30^a leads from the other member of the same contact out of the said box, through a conductor 30^a to a point 59 on the conductor 30^a connected with the make-and-break device 6 in position G, after which the connections are the same as heretofore traced, and will be readily understood. It may be here stated that normally all of the circuit make-and-break devices with which the magnet 44 is connected have their circuits normally broken in the box 10 whether they are on one side of the track or the other.

In this description it will be assumed that the train is traveling toward the right, referring to Fig. 1, and in this event it will first reach the make-and-break device 6 in position A on the left-hand side of the track, and a depending actuating device 60 carried by the train will engage the housing lever, but no result will be produced, since the depending member 60 is free to swing away from its supporting beam 61 (see Fig. 9), consequently the circuit will still remain broken through the magnet 44 of the signaling mechanism. The next make-and-break device in order, that the train will reach, is that in position D on the right-hand side of the track, and the depending member 60 on the right-hand side of the train will act upon the housing lever of this make-and-break device to depress the same as illustrated in Fig. 10, since the depending member cannot swing away from its supporting beam 61, but is maintained in practically a vertical position, causing the housing lever to move downwardly. Normally the circuit is closed through the make-and-break device 6 in position D and the circuit may be traced therethrough as follows: from the point 53 on the feed wire 38, through the conductor 54 to the point 55, thence through a conductor 26^a to one of the members 24 of the contact 23 within the box 10 of the contact make-and-break device in position C, thence through the conductor 26 from the other member of the contact 23 to one of the members 24 of the contact 23 within the box 10 of the make-and-break device 6 in position D, thence through the contact 22 of the lever arm 21 to the other member of the contact 23, thence out of the box 10 through the conductor 26, into the casing 45 of the signal post 37, to the terminal 62 of the magnet 63, thence from the opposite terminal 64 of said magnet through a conductor 65 to the conductor 49, and thence out of the said casing to the feed wire 52 as heretofore explained. Hence the magnet 63 is normally energized and has a tendency to maintain its bell crank lever armature 66 in contact with its pole pieces (see Fig. 2), in which event the arm 67 of the bell crank lever device 66 engages the said pole pieces, while the arm 68 is weighted as shown at 69, and engages a stationary contact 70 whereby the circuit is closed through a motor 71 and a green light 72, the circuit being broken through a red light 73 and a bell 74 mounted on the upper part of the signal post (see Fig. 4). Prior to the closing of this circuit it must be understood that the signal arm 75 was in the danger position or that illustrated in Figs. 1 and 4, and a lug 76 on the gear wheel 77 in engagement with a movable contact arm 78, the latter in turn being in engagement with a stationary contact 79, the contact arm 78 being retained in its position by a friction spring 80 when once adjusted as illustrated in Fig. 3.

It will be understood from an inspection of the drawing (see Figs. 2 and 3), that in order to close the circuit through the motor 71, it is necessary that the contact arm 78 be in engagement with the stationary contact 79, since the circuit in which the motor is located may be traced from a point 56 on the feed wire 38 (see Fig. 1) through the conductor 57, into the casing 45, thence through a short conductor 81 to the movable arm 78, to the contact 79, thence through a conductor 82 to the motor 71, and thence from the motor through a conductor 83 to a conductor 84, the circuit being completed through a contact 70, the arm 68 of the bell crank lever armature 66, thence through the conductor 49 to the feed wire 52 as heretofore explained. At the same time that the circuit is closed through the motor it is also closed through a magnet 86, since a wire 87 leads from the conductor 82 to a terminal 88 on the magnet 86, while a conductor 89 leads from the opposite terminal 90 of the magnet to the conductor 83, whereby the current which supplies the motor is

shunted through the said magnet simultaneously with the closing of the motor circuit. The energizing of the magnet 86 results in actuating a leverlike armature at 91 fulcrumed at 92, and connected by means of a link 93 with a clutch 94 carried by a link 95, whose upper extremity is pivotally connected as shown at 96, with a stationary arm 97 carried by a shaft 98 on which is mounted a worm wheel 99 operated by a worm 100 on an armature shaft 101 of the motor 71, the said armature shaft being journaled in a bearing 102.

The movement of the lever 91 into engagement with the cores of the magnet 86, serves to throw the clutch member 94 into engagement with a coöperating clutch member 103 journaled on the shaft 98 and carrying a pinion 104 meshing with the gear 77 fast on a shaft 105 journaled in the upper part of the hollow signal post (see Figs. 4 and 5.) Upon this shaft 105 is made fast a pulley 106 having a grooved periphery to which is secured as shown at 107, a cable 108 whose opposite extremity is connected as shown at 109 with a pulley 110 fast on a shaft 112 journaled in the signal post as shown at 113 and with which the gate signal arm 77 is connected. Hence assuming that the signal arm is in the danger position as illustrated in Figs. 1 and 4, the movement of the arm 68 of the bell crank lever armature into engagement with the contact lug 70, whereby the circuit is closed through the motor 71, will result in turning the gear 77 from the position shown in Fig. 3 to the position shown in Fig. 2, in which event the signal arm will be raised and locked in the raised position by a pawl 114, which engages a lug 115 on the gear 77. As soon as the parts have been actuated as just explained, a lug 116 on the gear wheel will have moved to the position shown in Fig. 2, whereby it has engaged and actuated the contact arm 78 to separate the latter from the lug 79, the circuit being broken through the motor and the magnet 86. In this event the armature lever 87 drops away from the cores of the magnet 86 by virtue of the fact that the armature 87 has its lower extremity weighted and projecting away from the magnet for the purpose. This movement of the magnet disconnects the clutch members 94 and 103, leaving the gears 104 and 77 free to operate and the signal arm free to drop to the danger position as soon as the pawl 114 has been disengaged from its interlocking lug 115. Hence in Fig. 2 the parts are shown in the positions which they assume after the signal arm has been raised to the safe position and the circuit broken through the motor, while in Fig. 3 they are shown in the position which they occupy when the signal arm has dropped to the danger position.

It will be understood that when the signal arm moves to the danger position the gear 77 moves in the direction of the arrow adjacent said gear in Fig. 2, while when the signal arm is raised to the safe position, the said gear moves in the opposite direction or the direction of the arrow adjacent said gear in Fig. 3. Now assuming that the signal arm is in the safe position, it is only necessary in order to allow it to assume the danger position, that the normally energized magnet 63 shall be momentarily deënergized in order to allow the armature 66 of the magnet 63 to assume the position shown in Fig. 3, whereby the arm 68 becomes disengaged from the contact 70 and engages an adjacent contact 117. This is accomplished as soon as the train reaches the make-and-break device 6 in position D, and in this event the depending device 60 carried by the train will act upon the lever 7 to depress the same, whereby the lever 14 will be actuated sufficiently to disengage the contact 22 of the said lever from the contact 23 of the corresponding box 10, thus breaking the circuit through the magnet 63 and allowing the armature 66 to drop to the position shown in Fig. 3. As soon as this occurs the armature 118 of the magnet 44 will serve to lock the armature 66 in the position to break the circuit through the motor. As soon, however, as the train passes the make-and-break device 6 in the position D, the lever 14 will return to its normal position under the influence of gravity and the spring 31, its movement being only slightly retarded by the dash pot construction 32. Hence the magnet 63 will be reënergized, but the armature 66 maintains its disengaged position, since it is locked by the hook-shaped extremity 119 of the armature 118. Hence the signal arm will remain in the danger position (see Fig. 1), until after the train has passed the signal station or crossing, in which event the depending member 60 carried by the train will act upon the lever 7 of the make-and-break device 6 in position E, to depress the same and close the circuit through the magnet 44, by the raising of the contact 22 of the lever 14 into engagement with the contact 27 within the box 10 of the make-and-break device 6 in position E, since in this particular make-and-break device the conductors 30 and 30^a are connected with the members 28 of the contact 27 and the circuit is normally broken through the magnet 44. However, as soon as a train arrives, traveling toward the right (see Fig. 1), the circuit will be closed through the aforesaid magnet, and as the latter is energized its armature 118 is raised and the armature 66 unlocked, allowing the latter to move in response to the influence of the magnet 63, whereby the armature 66 assumes the position shown in Fig. 2, when the circuit will be closed through

the motor 71 and the magnet 86, in which event the mechanism will be actuated to raise the signal arm, thus indicating a clear track as soon as the train leaves the crossing.

At the same time that the circuit is broken through the motor and the magnet 86, placing the gearing mechanism in position to operate without the resistance of the worm gearing, a magnet 120 is deënergized and its armature 121 allowed to fall to the vertical position (see Fig. 2), and a pin 122 of an arm 123 of the armature acts upon the outer extremity of the pawl 114 to actuate the latter and disengage the hook-shaped extremity 124 of the pawl from the lug 115, thus removing all the resistance to the movement of the signal arm to the danger position. As soon as the arm falls to the danger position, the gear 77 moves to the position illustrated in Fig. 3, and during such movement a pin 125 carried by the gear 77 acts upon the arm 123 of the armature 121 and throws the armature into engagement with its magnet 120. During this operation the arm 123 of this armature has been moved to the position to allow the pawl 114 to assume the locking position, whereby its hooked extremity 124 is in position to automatically engage the lug 115 on the gear 77, as soon as the said gear is actuated to raise the signal arm to the safe position (see Fig. 2).

The circuit through the magnet 120 may be traced as follows: from a point 56 on the feed wire 38, through a conductor 57, into the casing 45, thence to a point 126, whence it passes downwardly through the conductor 127 to a terminal 128 of the magnet 120, and thence from the opposite terminal 129 of said magnet to a point 130 of a conductor 131. It will thus be seen that the circuit is broken through the magnet 120 when the arm 68 is disengaged from the stationary contact 70, and it is also broken through the green light 72. The circuit may be traced through the green light from the point 126 of the conductor 127, through a conductor 132, which passes through an opening 133 in the casing 45, and a registering opening 134 of the hollow post 37. This conductor 132 leads to a point 135, from which a conductor 136 leads to the green light 72, whence a conductor 131 leads through the registering openings 134 and 133, and thence downwardly to the contact 70 indicating that the circuit is broken through the green light simultaneously with the breaking of the circuit through the motor and the magnet 86 between the contact 70 and the arm 86, to allow the signal arm to fall to the danger position. At the same time that the signal arm is to the danger position, the circuit is closed through the red or danger light 73, and the bell 74. The circuit through these danger signals may be traced as follows: from the point 135 (see Fig. 4), through a conductor 138, to the bell 74, thence through a conductor 139, to the red light 73, thence through a conductor 140, to the lights 141 carried by the signal arm, thence back through a conductor 142, through the openings 134 and 133, and thence down through the same conductor to the contact 117. As the balance of the circuit in both directions has been heretofore several times traced, it is not considered necessary to trace said circuit beyond the point of beginning, 135, and the contact last mentioned, namely 117.

In order to prevent the signal arm when the supporting mechanism is released, from falling too quickly to the danger position, the pulley 106 is connected with a dash pot 143, the piston 144 being connected by means of a stem 145 with a wrist pin 146 attached to the pulley beyond its center. When the signal arm is in the raised or safe position, the piston occupies its lowermost position within the dash pot. As soon as the signal arm starts to fall, the necessary rotation of the pulley 106 is retarded by the resistance offered by the upward movement of the piston in the dash pot, the piston being provided with a relatively small aperture 147 to allow the air to enter the cylinder of the dash pot in the rear of the piston. This retarding action prevents the sudden falling of the signal arm and the concussion or jar on the mechanism incident thereto.

From the foregoing description the use and operation of my improved signaling apparatus will be readily understood. If we assume that the signal arm is in the safe or raised position, being the position corresponding with the position of the various parts of the operating devices illustrated in Fig. 2, it will be desirable for the signal arm to be placed in the danger position as the train approaches the same. Referring to Fig. 1 and assuming that the train is approaching from the left and traveling toward the right, as soon as it reaches the make-and-break device 6 in position D on the right-hand side of the track, the depending member 60 will act upon the lever 7 to depress the same and break the circuit in the box 10, by disengaging the contact 22 from the contact 23. This will break the circuit through the magnet 63 and allow the arm 67 of the armature 66 to move away from the magnet 63, or to assume the position shown in Fig. 3. This will break the circuit through the motor 71 and the magnet 86, whereby the clutch connection between the worm gearing and the operating gears for maintaining the signal arm in the raised position is broken. At the same time the circuit will be broken through the magnet 120, whereby its armature 121 is allowed to fall to the vertical position, this action of the armature acting on the pawl 114 to

unlock the gear 77. In this event the signal arm will gradually move downwardly, resisted only by the friction of the operating mechanism, supplemented by the dash pot mechanism 143. As soon as the arm falls to the danger position, the pin 125 on the gear 77 will act upon the armature 121 to throw it into engagement with the magnet 120, whereby the pawl 114 is released and its hook-shaped extremity 124 allowed to assume a position to engage the lug 115 when the signal arm is raised. The signal arm now is in the danger position and the armature 66 of the magnet 63 is locked against moving into engagement with the cores of the magnet 63 by the armature 118 of the magnet 44, the latter being deënergized at this time as heretofore explained. The signal arm will now remain in the danger position and the danger light 73 will remain lighted until the train has passed the signal station or crossing, and after this occurs, the train will encounter the make-and-break device 6 in the position E and actuate the lever 14 to close the circuit through the contact 27 in the box 10, thereby closing the circuit through the magnet 44 and disengaging the armature 118 from the armature 66, whereby the arm 67 of the latter is allowed to move into engagement with the cores of the magnet 63, thus closing the circuit through the motor, the magnet 86, and the magnet 120, whereby the worm gear is actuated to move the gear 77 in the direction of the arrow adjacent said gear in Fig. 3, thus raising the signal arm or placing it in the safe position as the train is leaving the crossing, the arm being locked in this position through the instrumentality of the pawl 114 and the lug 115 (see Fig. 2). Thus it will be seen that the depending members 60 arranged on opposite sides of the train are active in depressing the levers 7 of the make-and-break devices 6 on the right-hand side of the track going in either direction, for the purpose of breaking the normally closed circuit through the magnet 63 in order to place the signal in the danger position, or closing the circuit through the normally deënergized magnet 44 for the purpose of releasing the armature 66 and allowing the latter to move into engagement with the magnet 63, whereby the circuit is broken through the danger signal light 73 and closed through the motor and other coöperating parts for raising the signal arm to the safe position. The make-and-break device for breaking the circuit through the magnet 63 is located in advance of the signal which is to be thrown to the danger position, while the make-and-break device for closing the circuit through the magnet 44 is located beyond the signal station or crossing where the signal is located. In other words, as the train is approaching the crossing it serves to automatically display the danger signals by allowing the arm 75 to drop, and closing the circuit through the red light 73. These make-and-break devices for breaking the circuit through the magnet 63 and closing it through the magnet 44, are so arranged that they display the danger signals forward of the train and throw the same signals to the safe position in the rear of the train regardless of the direction in which the train is traveling.

Having thus described my invention, what I claim is:

1. The combination with a signal arm weighted to fall, of an electric motor for raising the said arm, a circuit in which the motor is located, a normally energized electro-magnet whose armature is arranged to close the motor circuit when in engagement with the magnet, track make-and-break devices adapted to be operated by the train for momentarily breaking the circuit through the magnet, whereby the armature moves away from the latter and breaks the motor circuit, and a normally deënergized electro-magnet whose armature is arranged to engage and lock the armature of the normally energized magnet when the armature of the last named magnet moves away from the latter when deënergized.

2. The combination with a signal arm weighted to fall, of an electric motor for raising the said arm, a circuit in which the motor is located, a normally energized electro-magnet whose armature is arranged to close the motor circuit when in engagement with the magnet, track make-and-break devices adapted to be operated by the train for momentarily breaking the circuit through the magnet, whereby the armature moves away from the latter and breaks the motor circuit, a normally deënergized electro-magnet whose armature is arranged to engage and lock the armature of the normally energized magnet when the armature of the last named magnet moves away from the latter when deënergized, and distinct track make-and-break devices arranged to be operated by the train for momentarily closing the circuit through the normally deënergized magnet, whereby the armature of the normally energized magnet is released and allowed to move into position to close the motor circuit.

3. The combination with a signal arm weighted to fall, of an electric motor for raising the said arm, a circuit in which the motor is located, a normally energized electro-magnet whose armature is arranged to close the motor circuit when in engagement with the magnet, track make-and-break devices adapted to be operated by the train for momentarily breaking the circuit through the said magnet, whereby the arma-

ture moves away from the latter and breaks the motor circuit, a normally deënergized electro-magnet whose armature is arranged to engage and lock the armature of the normally energized magnet when it moves away from the latter, a gearing connection between the motor and the signal arm, and an electro-magnet for making and breaking said connection, the said magnet being in shunt with the motor circuit and arranged to close said connection when the magnet is energized and break the same when the magnet is deënergized.

4. The combination with a signal arm weighted to fall, of an electric motor for raising the said arm, a circuit in which the motor is located, a normally energized electro-magnet whose armature is arranged to close the motor circuit when in engagement with the magnet, track make-and-break devices adapted to be operated by the train for momentarily breaking the circuit through the said magnet, whereby the armature moves away from the latter and breaks the motor circuit, a normally deënergized electro-magnet whose armature is arranged to engage and lock the armature of the normally energized magnet when it moves away from the latter, a gearing connection between the motor and the signal arm, an electro-magnet for making and breaking said connection, the said magnet being in shunt with the motor circuit and arranged to close said connection when the magnet is energized, and break the same when the magnet is deënergized, means independent of the gearing connection for locking the signal arm in the raised position, electro-magnetic means for releasing said locking device, said electro-magnetic means deënergized by the movement of the armature away from the normally energized magnet when the latter is momentarily deënergized, the said means when deënergized serving to release the said locking device.

5. The combination with a pivotally mounted signal arm, of an electric motor for raising the said arm, a circuit in which the motor is located, an electro-magnet whose armature is arranged to close the motor circuit when in engagement with the magnet, track make and break devices adapted to be operated by a train for breaking the circuit through the magnet, whereby the armature moves away from the latter and breaks the motor circuit, and a second electro-magnet whose armature is arranged to engage and lock the armature of the first named magnet, when the armature of the first named magnet moves away from the latter when deënergized.

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

WILLIAM J. COOK.

Witnesses:
HORTENSE UHLRICH,
F. E. BOWEN.